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REPAIR PARK OPERATION

Instructions, for the use of
Officers and Men of the
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AMERICAN EXPEDITIONARY FORCES

HEADQUARTERS SERVICES OF SUPPLY

Office of the Director, Motor Transport Corps

January 14, 1919.

The following shop organization and methods having been developed from experience in the United States and the A. E. F. and having been approved by a Board of Officers consisting of Colonel Edgar S. Stayer, M. T. C., Inspection Division; Lieut. Colonel Mark L. Ireland, M. T. C., Repair Division, and Major Allen W. Pollitt, M. T. C., Chief of Maintenance, Advance Section, is published for the information and guidance of all concerned.

M. L. WALKER,
Brigadier General, U. S. Army,
Director, Motor Transport Corps.

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CHAPTER I

ORGANIZATION

Fundamentals

1. The fundamental requirements for repair (reception) park organization may be summarized as follows:

(a) One commanding officer over all branches, departments and functions;

(b) Unison of authority and responsibility, each commensurate with the other in the same individual from commanding officer down;

(c) Subdivisions which definitely fix duties;

(d) Uniformity of organization with other parks.

Tables of Organization

2. The Organization Tables for Repair Units, No. 355-Repair Group and Repair Unit, No. 356 Repair Section (or Repair Unit), and No. 360-Service Park Unit, were devised as the result of the actual experience in the A. E. F. which supplements and corroborates Mexican Border experience. The organization is not such a one as would be devised for the operation of a factory or shop which never moved, and which had a constant and uniform demand for a certain fixed product.

3. The organization developed as a result of military experience compares to the one which would be developed for commercial work in the same way that a series-wound motor compares with a compound-wound motor. The first type handles an empty street car on a level street or a street car bringing the crowd up a steep grade on the way back from the sun-down baseball game with greater efficiency than would a compound-wound motor, while the latter shows better efficiency on a steady full load. The military organization must possess the flexibility to meet a wide variety of conditions, even if it does not meet normal full load conditions quite as well as would some other organization.

System of Subdivisions

4. The organizations prescribed in the above tables possess a quality essential to military service, namely, capability for operation in subdivisions or with a man power of any size obtained by the simple expedient of multiple reinforcements. That internal cohesion necessary to insure ability to function as general mechanics or as specialists is obtained by providing certain definite steps in the pyramiding of the sections to form the group and of the sections and groups to form the units. The term unit indicates the organization which may be most often expected to meet the average military requirements. A repair unit is therefore the normal personnel for an overhaul (reception) park, while a service park unit is the normal personnel for a service park.

5. The military conditions, requiring the establishment of a repair (reception) park, compel the throwing forward to the new location of an advance party which may be either a section or a group. If the situation is a temporary one, the section or group is withdrawn when the need for its service ceases to exist. When military conditions intensify the demands for repair (reception) work in this locality, the strengthening of the first party proceeds by progressive additions to any required size as a group, a unit or several units. In order that the overhaul park may be within reasonable distance of the organizations to be served, its strength will seldom exceed that of a repair unit and one or more attached service park and transport companies. When its distance from the actual scenes of operations, the volume of its work, and the development of its buildings, facilities and equipment change the character of work, it becomes a reconstruction park with two, three, or more repair units engaged upon reconstruction, the necessary sections, groups or repair (supply) units of parts men for supply depot work, and the proper number of service park units for service repair.

ORGANIZATION OF TYPICAL SERVICE PARK

Organization Chart

6. The organization of the typical service park follows closely the schematic plan laid down for the typical overhaul park. Compare the charts shown for each. The detailed description of the functions of different elements of an overhaul park, as given below, are readily applicable to the operations of a service park, when due consideration is given to the difference in purpose of the two parks. This difference is clearly defined in Par. 57, Manual of the Motor Transport Corps.

7. From the standpoint of relative mobility the mobile service park consists essentially of two parts:

Subdivisions Based on Mobility and Service

(a) The unit headquarters and repair section which has mobility in order to keep its working point at the center of the shifting zone which it serves;

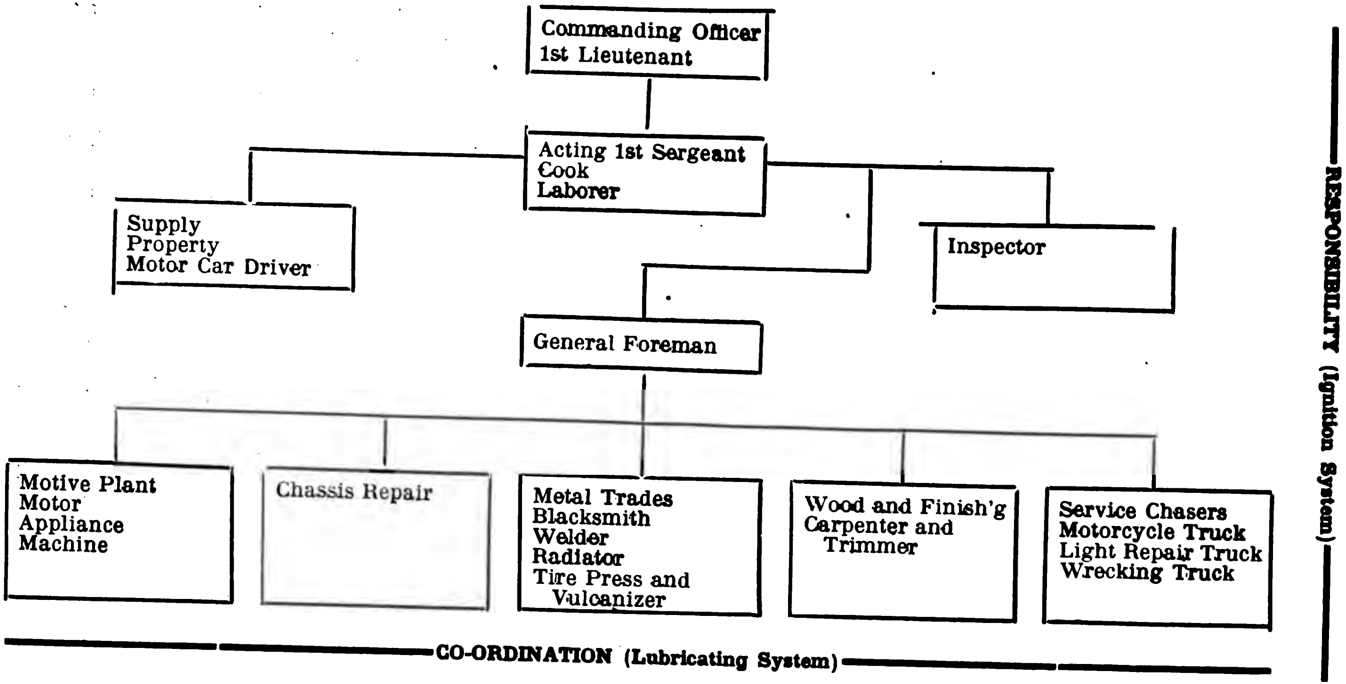
(b) The service chaser section which retains its mobility and renders light service upon call at points within its shifting zone.

8. Part (a) is to the complete service park unit what the repair unit is to an overhaul park, while part (b) is the counterpart of the service park unit in the overhaul park. Part (b) is the first aid personnel, the first appeal, and the 24-hour service men when such service is necessary. Information, courtesy, and willingness are the items which make up service upon the part of these men in a far greater degree than actual time consuming repair.

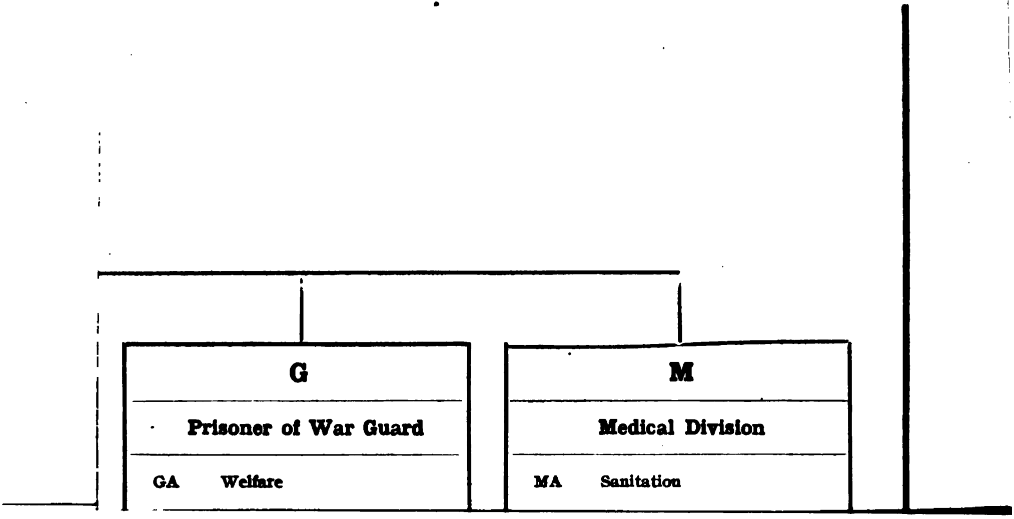
General Instructions

9. General instructions for the information and operation of service parks are contained in the following paragraphs of the Manual of the Motor Transport Corps:

59 to 76 Service Parks.
95 to 105 Salvage System.



MOTOR TRANSPORT CORPS
A. E. F. Repair Division
Organization Chart for Service Park


G
Prisoner of War Guard
GA Welfare
M
Medical Division
MA Sanitation

[illegible]
line;

M
M
AP
M

245 to 420	Regulations for Operating Organizations of General Interest and Application to Service Parks.
485 to 506	Property Accounting System of the M. T. C. A. E. F.
508 to 515	Vehicle Classification, Marking and Numbering; Synopsis of M. T. C. Forms showing their purpose and use.
538 to 603	Unit Equipment Lists, Miscellaneous Data, Tire Data, Rules for Correspondence, Care and Upkeep of Storage Batteries, Tire Equipment and Authority of Park Commander.

10. Service Park Commanders should understand and instruct their noncommissioned officers in the subject of Repair Methods of M. T. C. as outlined.

11. No part of these instructions are of greater importance to the success of service parks than par. 61-f, Manual of the Motor Transport Corps, and conclusion (1) under «Repair Methods of M. T. C.» Service success is measured by «How many jobs have you done?’’ and not by «How difficult a job can you do?»

ORGANIZATION OF TYPICAL OVERHAUL PARK

Organization Chart

12. The Overhaul Park Organization Chart is designed to secure the fundamental requirements stated in paragraph 1. An organization chart serves to block out and clearly separate the functions of the several park subdivisions, their relations to each chart show in a general way the relative degrees of responsibility chart show in a general way the relative degree of responsibility and the coordination which should exist between each one and all ot the others.

13. The idea of responsibility to a superior for prompt and ready obedience to his orders and directions is the cornerstone of organization, and that most valuable something described as *esprit de corps*. Having accepted this first foundation stone of organization, the new member of it next lays as a foundation principle that his superior is responsible for giving him guidance and direction. The third element, which completes responsibility, is a factor which can best be described by the ideas of loyalty to a superior and to the organization, a degree of initiative which does not require for usual and routine matters the impulses of direction before action starts and, finally, fidelity to duty. The initiative action of the superior and response of the subordinate is similar to the action of the ignition system of a motor vehicle. It is the primary impulse which makes the thing go.

14. Coordination in an organization is like the lubricating system. It is the thing which makes the organization run smoothly. Coordination is the most difficult element to perfect and maintain. The four things which most frequently defeat it are:

(a) The inclination to report your fellowman to a superior without first making an effort to understand his motive and reach an agreement with him;

(b) Jealousy of authority because the other man, in coming fully up to the line of demarkation between his department and yours, is believed to have overstepped the line;

(c) Failure to come up to the line of demarkation, either through fear of jealousy on the part of the man on the other side, or through indifference to the necessity for close cooperation. The leaving of a gap on either side of the line of demarkation is much more frequent than overstepping the line;

(d) Official intolerance of the other man for personal reasons.

15. The names selected for divisions, departments, and shops have been chosen with great care in order that they may be brief, and at the same time, possess the maximum amount of suggestive value as to the scope and limitations of each. The several park divisions and the departments of the Production Division, «O» have been given a letter symbol, the purpose of which is to aid in the designation of different departments for administrative purposes. For the functions and limitations of the several divisions, see the headings devoted to each below.

Harmonizing Military Necessity and Industrial Efficiency

16. The problem of an overhaul park commander is to organize disorder. The many conflicting demands between administering and operating a complicated industrial plant by military methods, with personnel that must be both military and industrial in character and appearance, of meeting military demands for security, expedients and for a nonfailure record under conditions which cannot be anticipated and, concerning which, advance information is seldom available, calls for a careful blend of all that is good in military and industrial experience. The sooner one learns that his park is only an infinitesimal factor in the military machine, that ideals can only be distantly approximated, and that strictly military or strictly industrial systems are doomed to failure, the more readily will he slide into the groove dictated by often repeated experience under the variety of conditions by which the army's present military-industrial policies were forged into shape.

17. Sweeping aside the thousand «ifs» on which the first notions and plans of the hundreds of contributors to the present one were wrecked, there appears three definite purposes for the overhaul park commander, namely:

(a) A discipline and morale in his military organizations which teach that nothing is impossible and nothing must permanently discourage;

(b) An acceptance of the principle that military efficiency is counted in terms of *results now* and not in terms of industrial efficiency and the perfected niceties possible in peace;

(c) An organization that, while giving *results now*, will be capable of giving all possible consideration to efficiency as judged by industrial standards.

Subdivisions Separating Quick Service from Industrial Effort

18. This separation must cover the Supply Division, «U», the camp for transient personnel, the park for transient vehicles, and finally repair itself. The Supply Division «U» solves its problem by a special issue window for outside demand, where service must be prompt at the expense of the park itself in many cases. It does not sacrifice the interest of the Service Park Department,

«S,» to outside calls, except in rare cases, since outside calls normally fall on supply depots. Special provision is made for transient personnel and vehicles, and for prompt loading and unloading. In all questions between double handling and delaying railroad or convoy transportation the army's inexorable decree is «Do the double handling and see that you do not get caught again.»

19. Quick repair service is only possible by taking that class of repair out of the main current of industrial effort. Hence the very distinct separation of Service Repair from Overhaul Repair in administrative as well as in production and inspection methods.

Personnel Organization Aimed at Avoiding Duality of Command

20. In order to carry out the system of subdivisions of the repair unit as outlined above, it has been necessary to provide for administration of 16 repair sections of four repair groups and one repair unit in each complete unit. The service park unit (or units) attached to an overhaul park in the Service Park Department «S,» is also provided with its own administrative personnel. When operating as an overhaul park with personnel equivalent to a repair group and a service park unit, and more particularly when operating with personnel equivalent to a repair unit and one or more service park units, there should be a surplus of administrative personnel which ought to be distributed to productive work. There should be no case arising in an overhaul park where a Headquarters Motor Command is required. Should an exceptional case occur where the administrative demands are particularly heavy, the remedy is to attach additional junior personnel to that provided by the units shown on the organization chart.

21. A division of authority between a park commander and the repair unit commander is not permissible.

General Instructions

22. For general instructions and information with reference to the operation of overhaul parks, see

(a) Those paragraphs of the Manual of the Motor Transport Corps listed under «Organization of Typical Service Parks» which apply equally to overhaul park operations;

(b) Paragraphs 77 to 85, Manual of the Motor Transport Corps, under caption «Overhaul Parks»;

(c) Those references to Manual of the Motor Transport Corps under «Receiving, Parking and Quartering of Convoys» below, which relate to care of convoys at overhaul parks.

Organization of Typical Reconstruction Park

23. The organization of the typical reconstruction park will follow that for overhaul parks. A reconstruction park usually contains a greater personnel than any one overhaul park. The number of reconstruction parks will be small. Main supply depots are usually located at reconstruction parks and take over the duties outlined for the Supply Division. Supply Depot personnel is usually placed in a separate repair unit composed of men selected for their fitness for supply duties. It is not desirable to dup-

licate supply division work because of the presence of supply depot personnel, and of certain supply personnel in the repair units assigned to the reconstruction park. The commander of the reconstruction park must command all troops, the supply depot, and the reconstruction park, in order that there may be no division of responsibility.

24. The most difficult problem presented in the reconstruction park organization is that of deciding between the shop demand and the demands from outside sources for the same supplies. When supplies are short, this situation is apt to become very acute. Each case must be decided upon its merits by the reconstruction park commander himself, when special occasion arises not fully covered by general instructions. This authority must be rested in the hands of the commanding officer on the spot, and his judgment accepted. He cannot escape full responsibility for his decisions—hence he must be given full and unhampered authority to make them. He utilizes all available sources of information as a guide.

CHAPTER II

DUTIES OF OFFICERS, DIVISIONS, DEPARTMENTS AND SHOPS

DUTIES OF OFFICERS

Park Commander

25. Overhaul (reception) park commanders are appointed by the section motor transport officer, subject to approval of the Director of the Motor Transport Corps. Reconstruction park commanders are appointed by the Director of the Motor Transport Corps. Overhaul (reception) park commanders may be temporarily appointed, suspended or removed from command by the section motor transport corps officer. During the absence or sickness of the regular overhaul (reception) or reconstruction park commander the senior motor transport corps officer present for duty commands for the time being.

26. Overhaul (reception) and reconstruction park commanders, unless acting under special instructions, exercise the functions of a post commander, as may be prescribed in Army Regulations and orders from time to time.

Repair Unit Commanders

27. Repair Unit commanders exercise the authority of regimental commanders, except that promotions to noncommissioned grades above the grade of sergeant are made by the Director, Motor Transport Corps, upon the recommendation of the repair unit commander.

Service Park Unit Commanders

28. Service park commanders exercise the authority of a company commander, promotions in service park units, to and including the grade of sergeant, are made on the recommendation of the service park commander, by the overhaul (reception) park commander, reconstruction park commander, section, division, corps or army motor transport officer under whom the service park unit may be serving. Promotions to noncommissioned grades above the grade of sergeant are made by the Director, Motor Transport Corps, upon the recommendation of service park unit commanders.

29. Appointments as mess sergeant or first sergeant are made from the grade of sergeant by the repair section or service park unit commander concerned. Appointments of privates first-class, and cooks from the grade of private are made by the repair section or service park unit commander concerned.

Group and Section Officers

30. Officers are assigned to repair sections and repair groups by repair unit commanders. It being an essential element of

military preparedness that each unit be capable of immediate operation in separate groups or sections, all repair units will be at all times organized into the prescribed number of repair groups and repair sections.

Administration of Large and Small Parks

31. When repair sections are operating upon detached duties officers and men are required to perform duties of a very general character similar to service park personnel. Repair groups operating as detachments may have some specialization of duties and functions. Repair unit personnel has the majority of its officers and men upon specialized duties. In reconstruction park personnel specialization is still more marked. However, in order that officers and men may not, by extreme specialization, limit their suitability for detached service or for advancement to higher positions, repair group and repair section organization must be the basis for discipline and military instruction. Repair group and repair section paper administration should normally in assembled repair units be handled by the personnel adjutant. Suitable instruction and occasional practice must be given repair group and section officers.

32. The problem of detailing soldiers to work under other officers than their own group and section officers is not new in either the Army or Navy. The mastering of the difficulties arising is an essential part of the duties of an officer or soldier. The common motive of all, the best interests of the service, the welfare of the unit and the Motor Transport Corps must always be assumed as the motive of each officer and man until an improper motive is established. Narrow notions of *esprit de corps* only serve to mark the incapacity and unsuitability of the officer and man who entertains doubts as to the high purpose of his comrades and his equals in rank and authority.

EXECUTIVE DIVISION

33. The duties of the officers indicated below will be as follows:

(a) *Adjutant*: The Adjutant will perform the duties analogous to those prescribed by Army Regulations for Adjutants. It will be the duty of the Adjutant to exercise general administrative supervision and to be prepared to act promptly in the name of the Commanding Officer during the temporary absence of the Commanding Officer.

(b) *Personnel Officer*: The Personnel Officer is charged with the maintenance of service records, records relating to discharge, leave of absence and furloughs, records of transfer of enlisted personnel and officers from one department of the shop to another, or from this organization to another station, and vice versa. He will be responsible for the compilation of all personnel reports, returns, enlisted pay rolls, and all matters relating to allotments and insurance. In the absence of the Welfare Officer, he discharges the duties of Welfare Officer.

(c) *Welfare Officer:* The Welfare Officer will have jurisdiction and control over all mess halls and the post exchange. He will be responsible for the conduct of the same, as well as discipline of the personnel assigned thereto for duty. He supervises recruit instruction, noncommissioned officers' school, and aids in the development of officers' courses of instruction. In the absence of the Chaplain, he performs the welfare duties laid down for Chaplains.

(d) *Chaplain:* The Chaplain will have jurisdiction over the mail, the post office and personnel assigned thereto for duty. He will have charge of the recreations and amusements of the enlisted personnel and otherwise perform the duties analogous to those prescribed by Army Regulations for Chaplains.

SUPPLY DIVISION

34. The Supply Division is charged with all matters appertaining to finance except those arising within the province of the Post Exchange and Company Funds; with the procuring, receiving, tracing, storing, caretaking, exchange, issuing, shipping, invoicing, accounting, disposition and security of all raw material, spare parts, and plant equipment. This means no storing of stock or supplies in shops, power plants or other places not specifically authorized.

35. The Supply Officer is directly responsible to the Commanding Officer for:

(a) All of the duties and responsibilities appertaining to a post quartermaster, except those specifically lodged with the Inspection Division, and the Production Division;

(b) All the duties of a regimental supply officer;

(c) All of the functions appertaining to the prompt and expeditious supply of material required for manufacturing, repair or salvage repair.

36. It is especially enjoined upon the Supply Officer to:

(a) Carry out the provisions of par. 485 to 506, Manual of the Motor Transport Corps, relative to M. T. C. property accounting;

(b) Account for all other forms of property according to regulations issued from time to time;

(c) See that every effort is made to keep dead stock from accumulating;

(d) That ample supplies are maintained in order to prevent waiting for parts or supplies;

(e) That all officers and soldiers obtain from him a clearance in writing before leaving the post, that all vehicles and supplies in reserve are kept in the best possible condition, and that the repair of material or equipment shipped in upon invoice shall not be delayed, pending receipt of invoices or specific instructions with reference thereto, unless the circumstances in each particular case shall make it beyond reasonable doubt that prompt repair is inadvisable.

37. The absence of specific instructions upon any detail or point arising under the above general instructions in no way relieves the supply officer, or his assistants from full responsibility for such foresight, attention, and action as the circumstances may require.

Departments of Supply Division

38. The *Department of Administration*, «UA» covers finance, property accounting, invoice and receipting, administrative procurement and tracing.

39. The *Motor Transport Stockroom*, «UB,» handles storing (either in bulk or in bins), caretaking, exchange, local issues to shops or outside parties, disposition and security (those phases of security not within the province of the guard), of all raw material, spare parts and plant equipment.

40. The *Shipping and Receiving Department*, «UC», performs the duties indicated by its name. It turns over to department «UB» for storage all supplies after they have been received and checked. It checks against shipping orders all supplies received from department «UB», prepares them for shipment, and makes shipment.

41. *Park Transportation Department*, «UD», is either a pool of exclusively park transportation or the department which handles all transportation furnished to the park from a neighboring transportation pool.

42. The *Reserve Park Department*, «UE», is that machinery in the way of equipment and personnel, and that «ready for issue» transportation for which the Supply Officer is responsible and from which he makes issues or assignments upon the receipt of proper orders from higher authority.

43. The *Equipment Department*, «UF», is the department charged with the handling of all equipments pertaining to the repair unit or the service park unit as military organizations. This includes clothing, individual tool kits, mess kits, camp, barrack and office equipment and stationery supplies. It also includes subsistence supplies when the Supply Officer is called upon to perform those functions. In general, it handles no Motor Transport Corps Supplies except individual tool kits of the soldier. For method of replacing tools lost by shop workmen see paragraph on «Tool Service». For composition of and regulations governing individual tool kits, see that paragraph heading.

INSPECTION DIVISION

44. It shall be the duty of the commander of all M. T. C. repair (and reception) parks, of whatever class, to appoint a Chief Inspector and to organize an Inspection Division, which is directly responsible to the Commanding Officer.

The duties of the Inspection Division are:

(a) Receiving all work not invoiced or shipped in on a bill of lading;

(b) Diagnosis immediately after receipt of all repair or manufacture operations required;

(c) The preparation of all work orders, Form 112;

(d) Inspection and, when necessary, report upon all shop and shop supply functions, methods, activities, and security;

(e) Inspection and test of all finished work;

(f) Notification of Officers and Shop Departments, who are to pass upon or ship complete jobs and also those outside parties who are to call for completed jobs.

45. All work orders must show in detail the work to be performed so that the inspectors of the completed work may know the nature and extent of the work intended. See paragraph heading «Movement of a Work Order.»

46. Final inspection of all work, whether repair work, manufactured article, salvage or tools, will be made by first checking the work done against the work order and then by making such examinations and practical tests as may be necessary.

47. The Chief Inspector will see that jobs requiring *special* inspection, as provided in paragraphs 48 and 49, do not leave the premises, or, if intended for park use, are not put into use until the completed work order is O. K.'d by the representative of either the Efficiency Department «OA» or the Supply Officer, as the case may be.

48. Work order for *special* work covered by blue prints and specifications will be indorsed, «To be passed upon by the Efficiency Department 'OA,' before the work is released.»

49. Work orders for manufacturing tools, parts, furniture, fixtures, or equipment, whether for shop use, stock or on shipping orders, will be indorsed, «To be turned in to the Supply Officer.»

50. Inspectors will, with discretion and tact, present to any party who is employing incorrect or wasteful practices or who has apparently neglected or overlooked a matter, or to the immediate superiors of said party such suggestions, recommendations or reports as are necessary to correct and improve unsatisfactory conditions or results. It shall be the purpose of inspectors, of whatever grade, to secure proper workmanship, methods, and production by suggestion and instruction with the productive personnel with whom they are directly associated, rather than by making official reports to their superiors. The necessity for making such official reports at times is recognized by paragraph 44, which makes the inspection force directly responsible to the Commanding Officer. An inspector, be he ever so skillful and experienced himself, is of little value when he can secure results only through official reports to his superiors.

51. The assistants to the Chief Inspector will keep him informed as to the general status of inspection work in their respective divisions and departments.

52. The Chief Inspector will in turn make suggestions, recommendations or reports to the Commanding Officer concerning such matters covered by paragraphs 50 and 51 as cannot be improved by his own forces.

53. The Inspection Division is charged with determining whether any given job is to be handled as a service, overhaul, or reconstruction job. In order to give proper expedition to the work they are charged with seeing that the different methods of handling service, overhaul, and reconstruction jobs, as outlined in paragraphs 61, 84, and 86, Manual of the Motor Transport Corps, are followed.

54. Paragraph (44-d), relative to security, places upon the Inspection Division the responsibility for everything affecting fire hazard or facilitating the prompt extinguishing of fires. The Inspection Division is also responsible for detecting careless practices that in any way affect the security of the Government's interests.

55. The Park Inspection Division is not charged with the executive measures necessary to security or correction of defective methods or practices.

56. The freight traffic officer designated by letter from D. M. T. C. to all Motor Transport Officers, S. O. S., November 7, 1918; File 141.6, Subject: «M. T. C. Property,» is an executive officer who acts upon information obtained through his own initiative or received from the Inspection Division or other sources.

57. For line of demarkation between general inspections by this department and sanitary inspections by the surgeon, see the paragraph on the Medical Division.

58. For a similar line between the Production Division and the Inspection Division, see paragraph, «Relations between Production and Inspection Divisions.»

Departments of the Inspection Division

59. The *General Inspection Department*, «IA» is concerned with general military inspections of camps, reservations, plants, and all forms and kinds of Government property from the standpoints of orderliness, cleanliness, smartness of appearance, security against fire, theft, depredations, damage by weather or other cause. It also covers all conditions affecting the general welfare, morale and instruction of the Government personnel, military or civilian. Discipline and instruction require that its work be supplemented by general military inspections in which all officers and men participate.

60. The *Diagnostician*, «IB», has charge of the receiving park, washing platform and accessories storeroom at the entrance gate, He receives, diagnoses by external examination and test, and routes every job at his discretion to the proper place as follows:

(a) Service parking space for service repair;
(b) Overhaul parking space for overhaul repair;
(c) Accessories repair from accessories storeroom;
(d) Salvage repair;
(e) Disassembling for salvage of parts;
(f) Plant construction and improvement;
(g) Plant maintenance;
(h) Parts and tool manufacturing;
(i) Miscellaneous jobs.

61. He makes out all work orders for all purposes whatsoever. He makes the only inspection required to start accessories repair. His action under (d) and (e) above are checked by the Chief Inspector before action begins. He does not receive parts, supplies, raw material, salvage (except salvaged vehicles) stock, fuel or construction material. He checks the «Orders for Material, Form 114» as laid down under «Spare Parts Service in a Shop.» Inspectors from this department perform similar functions in the Salvage Sorting Shop «QA.»

62. The *Diagnostician*, «IB», should not go to the point of attempting to determine by slow guesswork tests what can be positively ascertained by Final Analysis, «IC», in much less time. The Diagnostician, «IB», when working properly, accomplishes five purposes:

(a) He enables the Supply Division, «U», to take the maximum advantage of time;
(b) He provides early information as to the nature of each job;
(c) He acts as a steering agent for promptly shunting work into the right groove;
(d) He starts the continuous inventory of all vehicles and jobs;

(e) He removes and cares for accessories not needing repair, and initiates repair on those requiring such action.

63. The *Final Analysis Department*, «IC», is stationed at a bench over which passes all washed parts from the parts cleaning vats. The inspectors of this department pass finally upon what work is to be done, what parts are to be repaired, what salvaged and replaced and the completeness and sufficiency of the work order as first made out by the Diagnostician, «IB». The senior inspector checks the orders for material, «Form 114» as laid down under «Spare Parts Service in a Shop». Inspectors from this department stationed in the Salvage Examination Shop, «QC», perform a similar service there. When disassembly is not complete, this department passes upon the details of disassembly and arrests it at the proper point.

64. The *Supply Inspection Department*, «ID», covers all of the activities of the Supply Division and of the Salvage Disposition Shop, «QD».

65. The *Repair Checking Department*, «IE», passes upon the qualities of repairs made and upon the quality and quantity of parts delivered for assembling of units and for assembling units in chassis, including all work in Metal Trades Department, «T», and Wood and Finishing Department, «W».

66. The *Road Test and Final Inspection Department*, «IF», performs all duties indicated by its name for both overhaul and service jobs, and all other inspection duties not specifically assigned. Rejected work is handled by this department on an «A» work order as described under, «Movement of a Work Order, Form 112.»

67. After a car has been repaired, it will be road tested and inspected along the same lines as outlined for the guidance of the Diagnostician, «IB», under Hints for Inspectors. Particular attention is given to the parts that have been repaired as shown on the steering wheel copy of the work order. However, this inspection must once for all pick up the oversights of others. Nothing should be taken for granted. The exact condition of everything must be determined. Whether every minute defect shall be corrected or not then becomes a question of discretion, as it should be, upon which the Chief Inspector passes in person whenever necessary or desirable.

68. The Final Inspector will make sure that an M. T. C. caution slip is pasted to the windshield, dashboard, or other conspicuous place on the vehicle for the purpose of warning operating personnel concerned of the care which must be exercised in handling a stiff motor and in keeping it properly lubricated.

69. He also sees that all parts of the vehicle have been properly oiled and greased according to the lubrication chart supplied by the manufacturer. He sees that all nuts, bolts and other fasteners are properly set up.

70. After the Final Inspector has completed his inspection and is ready to signify his final approval, he will do so by having the prescribed markings as to date and place of repair stencilled upon the vehicle before it is placed in the R. F. I. park. Examples of the prescribed markings referred to are as follows:

For a vehicle which has been overhauled:

OVERHAULED
14 Jan. 19
By M. T. C. O. P.
731

For a vehicle which has passed through process of salvage repair:

SALVAGED
14 Jan. 19
By M. T. C. R. P
713-A

71 These markings should be placed in conspicuous places on the vehicle, as follows:

(a) For trucks: On right chassis channel.

(b) For motor cars: On driver's seat frame under cushion.

(c) For motorcycles: Under gasoline tank.

72. The object of distinguishing between overhaul and salvage repair is to indicate by the latter mark those vehicles which may not be expected to give as hard service as overhauled vehicles. This purpose must not be defeated by the erroneous idea that overhaul parks are authorized to use only the marking for overhaul repair and that reconstruction parks are authorized to use only the marking for salvage repair.

73. The *Road Test and Final Inspection Department*, «*IF*,» is also charged with observation of road operation of transportation assigned or detailed upon park duties. Transportation in a park pool is given its periodical technical inspection by this department. The same service may be performed for a neighboring pool.

74. The *Service Inspection Department*, «IG,» performs for the service park all of the duties outlined for Departments «IC» and «IE.»

75. Service jobs always receive first attention at the hands of all branches of the inspection department and elsewhere in the park.

PRISONER OF WAR GUARD

76. Instructions are issued from time to time defining the relations between prisoners of war guard companies and the commander of troops under whom they serve. The status of prisoner of war companies is similar to that of companies, battalions or other organizations in the post, except for certain reservations of authority that are especially announced from time to time which limit somewhat the general authority of the commanding officer of troops in comparison with other organizations.

77. The present status of these instructions is that the commanding officer of the camp to which they are attached is permitted to work those men during certain prescribed hours. The Provost Marshal General is responsible for their clothing, equipment, and general discipline through the local prisoner of war company commander. In ordinary cases the commanding officer of the camp applies the necessary corrective measures, but should refer anything of an unusual nature to the Provost Marshal General.

MEDICAL DIVISION

78. The Medical Division is charged with the duties of a post or camp surgeon and his medical detachment. The Surgeon and Chief Inspector will coordinate the sanitary inspections of the one with the general inspection service of the other.

79. Sanitary inspections are of a technical and professional character, intended primarily for the prevention of disease.

80. General inspections by the Inspection Division are of a military character, aimed at securing proper cleanliness, orderliness, and smartness of appearance. Nothing is left uncovered between the two. Proper cooperation will avoid any conflicting instructions due to some overlapping.

RELATIONS BETWEEN PRODUCTION AND INSPECTION DIVISIONS

81. The Production Division divides duties with the Inspection Division on these lines: The Inspection Division, whose aim is quality firstly and production secondarily, answers the questions:

(a) What shall be done?
(b) Has it been done?

82. The Production Division, whose aim is quantity firstly and quality secondarily, answers the questions:

(c) When shall the work begin?
(d) How shall it be accomplished?
(e) When will it be finished?

83. While the primary aims of the two divisions are reversed, they share the result in common. Their attitudes toward the work are different but, if either permits his secondary aim (the primary aim of the other) to become dwarfed, the results are strife and low production instead of cooperation and high production.

84. The Diagnostician of the Inspection Division feeds incoming vehicle jobs into two reservoirs, the service parking space and the overhaul parking space. Coordination between Inspection Division and Production Division keeps these reservoirs in that balance which is necessary in order to insure that service shall not lose its essential characteristic of promptness. The Production Division regulates the flow from these reservoirs.

PRODUCTION DIVISION

85. The Production Division exercises general authority over all repair (assembling), salvage and manufacturing facilities of the Park, including attached Service Park Units, and is charged with all repair (assembling), salvage, and manufacturing operations.

86. The Superintendent of the Production Division is directly responsible to the Commanding Officer for:

(a) Quantity and quality of work produced;

(b) No work being undertaken for which a work order has not been issued;

(c) The systematic collection by his office assistants of information on all current operations in such form as to make it readily available, covering the following points:

1. Type, make, Serial, and U. S. number of each vehicle in the park;
2. To whom vehicle is assigned;
3. Date received;
4. Work order number;
5. State of progress of work;
6. Vehicles sidetracked by pressure of other work;
7. Status of vehicle with reference to parts;

8. Date work began;
9. Date on which it will be completed;
10. Vehicles R. F. I. awaiting disposition.

(d) The prompt rendition of such time reports and completed work orders as may be required from repair (reception) parks of his type;

(e) No work being undertaken when it can be foreseen that its cost will be excessive until the work order has been approved by the commanding officer;

(f) Securing proper authority for all work which is not within the recognized scope and purpose of the park;

(g) The supervision of the industrial and technical instruction of all personnel;

(h) A balanced efficient shop.

87. The absence of specific instructions upon any detail or point arising under the above general instructions in no way relieves the Production Division from full responsibility for such foresight, attention, and action as the circumstances may require.

Motive Plant Department

88. The scope and purpose of this department is indicated by its title. Its foreman stands in the same general relation to the Production Division Superintendent as that in which the latter stands to the Commanding Officer. The same principle applies to the relations between shop foremen and the department foremen.

89. The Appliance Shop covers speedometers, carburetors, all classes of motor transport electrical equipment (except storage battery service), and small instruments like odometers, oil gauges, etc.

90. The Power and Electrician Shop covers the park power, lighting, and electrical maintenance.

Utility Department

91. The scope and purpose of this department is indicated by its title. The status of its responsible head is the same as in the Motive Plant Department.

Chassis Repair Department

92. The scope and purpose of this department is indicated by its title. The status of its responsible head is the same as in the Motive Plant Department.

93. The Tear Down Gang disassembles all major units and assemblies after they are removed from the chassis by a Rebuild Gang and pass the parts to the Parts Cleaning Gang, who clean all parts for the Final Analysis inspectors. The Riveting Gang replaces and tightens all rivets on frames, frame brackets, radiator guards, etc.

94. The Rebuild Gangs disassemble and assemble vehicles.

95. The Motorcycle and Bicycle Shop performs all necessary repair on these vehicles which are usually performed by the following shops and gangs—PA, PD, RA, RD, RC.

Metal Trades Department

96. The scope and purpose of this department is indicated by its title. The status of its responsible head is the same as in the Motive Plant Department.

Wood and Finishing Department

97. The scope and purpose of this department is indicated by its title. The status of its responsible head is the same as in the Motive Plant Department.

Service Park

98. The function of the Service Park is to make repairs and service exchanges, exchanging tires, batteries, repairing tubes, etc. Repairs which require slight machining, forging or welding will be sent to the Service Park on travel orders, M. T. C. Form No. 170, bearing the proper work order number, and describing briefly the repair that is to be done. Such jobs will give place to service work on vehicles which do not require disassembling work. The Service Park should not be used by outside parties as a means of dodging the making out and submitting of requisitions for the supplies they need.

CHAPTER III

DISTRIBUTION AND PRODUCTIVITY OF PERSONNEL

Distribution of Personnel

99. There are few factors which affect production as much as distribution of personnel. Close observation for a considerable time is necessary to detect surplusage, especially if the purpose is suspected. Apparent shortages are usually due to poor management or temporary peak loads. There arises then an urgent demand for the drawing of an approximate mean line between conflicting evidence as to how many men are required in each place in order to keep a fair balance. This line is drawn in the accompanying tables for Service Park Units, Repair Groups and Repair Units showing distribution and productivity.

Distinction Between Productive and Nonproductive Labor

100. The distinction is drawn along those lines of cleavage which separate labor which can be easily and readily charged to current production work orders from labor which cannot be so charged.

101. To successfully oppose the ever-present evil of labor sliding into unproductive channels, the line drawn must be sound from the standpoint of practicability. Rigid orders to reduce nonproductivity to a designated theoretical minimum would bring two results: Indifference to the order or a hampering of production by honest effort to convince onesself that certain essential steps can be avoided by plain denial of their necessity. Liberality means disorganization and indifferent production.

102. This tabulation, therefore, recognizes as unproductive the following men: (a) all officers, (b) principal enlisted foremen, (c) enlisted clerks for four commissioned general foremen and for superintendent, (d) necessary handy men for errands, sweeping and orderly arranging and classification of work, working materials, equipment not in use, parts in movement, (e) floating labor, (f) watchmen, (g) guard detail, (h) sanitary details, (i) mess, postal, post exchange and camp personnel, (j) chauffeurs, (k) all inspectors, stockkeepers. supply and park headquarters clerks, orderlies and jailors.

103. The tabulations for a Repair Unit, a Repair Group and Service Park permit testing conditions found to exist in a repair park of any size by simple proportion.

SERVICE PARK UNIT PERSONNEL

DISTRIBUTION AND PRODUCTIVITY

VOCATION	OFFICERS		MEN		PRO-DUC-TIVE	OVERSEAS PAY RATES		
						PROD. MEN	NON-PRODUCTIVE MEN	
	No.	%	No.	%		ENLISTED	ENLISTED	OFFICERS
COMMANDING OFFICER	1	100.00						183.33
Acting 1st Sergeant			1	2.85	No.		60.00	
Cook			1	2.85	No.		44.00	
Laborer			1	2.85	No.		33.00	
SUPPLY			1	2.85	No.		60.00	
Property			1	2.85	No.		40.80	
Motor Car Driver			1	2.85	No.		40.80	
INSPECTOR			1	2.85	No.		60.00	
GENERAL FOREMAN			1	2.85	No.		60.00	
MOTIVE PLANT								
Motor			2	5.71	Yes	96.60		
Appliance			1	2.85	Yes	60.00		
Machine			1	2.85	Yes	60.00		
CHASSIS REPAIR			6	17.22	Yes	228.60		
METAL TRADES								
Blacksmith			2	5.71	Yes	87.80		
Welder			2	5.71	Yes	87.80		
Radiator			2	5.71	Yes	77.40		
Tire Press and Vulcan			3	8.60	Yes	128.60		
WOOD AND FINISHING								
Carpenter and Trim			2	5.71	Yes	77.40		
SERVICE CHASERS								
Motorcycle Truck			2	5.71	Yes	87.80		
Light Repair Truck			2	5.71	Yes	87.80		
Wrecking Truck			2	5.71	Yes	87.80		
TOTALS	1	100.00	35	100.00		1,167.60	398.60	183.33

Personnel is shown assigned to their normal duties. They are shifted at will to meet the exigencies of the service

REPAIR GROUP PERSONNEL—DISTRIBUTION AND PRODUCTIVITY

Sheet No. 1

D means filled by details from other duties. Detailed duty is in addition to other duty.

VOCATION	OFFICERS		MEN		PRO-DUC-TIVE	OVERSEAS PAY RATES		
						PROD. MEN	NON-PRODUCTIVE MEN	
	No.	%	No.	%		ENLISTED	ENLISTED	OFFICERS
(A) COMMANDING OFFICER	1	9.091	2	.673	No.	...	84.20	220.00
(E) EXECUTIVE DIVISION	...	...	...	...	...	...	...	...
Adjutant	1	9.091	3	1.010	No.	...	120.80	183.33
General Office	...	...	...	...	...	...	...	...
Personnel	1	9.091	4	1.347	No.	...	198.60	155.82
Welfare	D	...	24	8.080	No.	...	998.80	...
Instruction	D	...	D	...	...	...	...	...
Security	D	...	D	...	...	...	...	...
(M) MEDICAL DIVISION	M	...	M	...	...	...	...	...
Sanitation	1	...	1	...	...	...	...	...
Prevention	...	...	1	...	...	...	...	...
Dentist	...	...	1	...	...	...	...	...
Service	...	...	1	...	...	...	...	...
(G) PRISONERS OF WAR GUARD	G	...	...	...	...	...	...	...
Welfare	G	...	G	...	...	...	...	...
Security	G	...	G	...	...	...	...	...
(U) SUPPLY DIVISION-ADMIN.	1	9.091	2	.673	No.	...	92.00	183.33
M. T. Stockroom	1	9.091	4	1.347	No.	...	179.80	155.82
Shipping and Receiving	...	...	2	.673	No.	...	102.40	...
Park Transportation	...	...	4	1.347	No.	...	175.60	...
Reserve Park	...	...	1	.337	No.	...	51.20	...
Equipment	...	...	4	1.347	No.	...	190.20	...
(I) INSPECTION DIVISION	...	...	...	...	...	...	...	...
General Inspection	1	9.091	4	1.347	No.	...	240.00	183.33
Diagnostician	...	...	2	.673	No.	...	120.00	...
Final Analysis	...	...	1	.337	No.	...	60.00	...
Supply Inspection	...	...	1	.337	No.	...	51.20	...
Repair Checking	...	...	1	.337	No.	...	51.20	...
Road Test and Final	...	...	3	1.010	No.	...	133.20	...
Service Inspection	...	...	*2	...	No.	...	...	...
SUBTOTALS	6	54.546	62	20.875			2,849.20	1,081.63

* From Service Park. Not counted in totals.

VOCATION	OFFICERS		MEN		PRO-DUC-TIVE	OVERSEAS PAY RATES		
						PROD. MEN	NON-PRODUCTIVE MEN	
	No.	%	No.	%		ENLISTED	ENLISTED	OFFICERS
(ubtotal Forwarded from P. 1	6	54.546	62	20.875	......	....	2,849.20	1,081.63
SO) PRODUCTION DIVISION	...	....	......	....	......	....	....	....
Superintendent	1	9.091	3	1.010	No.	....	118.20	183.33
Efficiency	...	....	1	.337	No.	....	36.60	....
Schedule and Routing	...	....	1	.337	No.	....	36.60	....
(P) MOTIVE PLANT DEPARTMENT	1	9.091	......	....	......	....	....	183.33
Motor	...	....	31	10.438	Yes 28 No. 3	1,052.20	171.20	....
Appliance	...	....	6	2.020	Yes 5 No. 1	245.60	51.20	....
Machine	...	....	8	2.694	Yes 7 No. 1	300.00	51.20	....
Axle and Transmission	...	....	14	4.714	Yes 13 No. 1	557.60	60.00	....
Power and Electrician	...	....	2	.673	No.	....	90.00	....
(Q) UTILITY DEPARTMENT	1	9.091	......	....	......	....	....	155.82
Salvage	...	....	23	7.744	No.	....	1 139.60	....
Labor	...	....	24	8.080	No.	....	792.00	....
(T) CHASSIS REPAIR DEPARTMENT	1	9.091	......	....	......	....	....	183.33
Tear Down	...	....	22	7.407	Yes 20 No. 2	794.60	102.40	....
Parts Cleaning	...	....	4	1.347	No.	....	161.60	....
Riveting	...	....	2	.673	Yes	87.80	....	....
Rebuild	...	....	26	8.754	Yes 24 No. 2	964.40	156.00	....
Motorcycle	...	....	18	6.061	Yes 16 No. 2	671.60	120.00	....
Bicycle	...	....	3	1.010	Yes	124.40	....	....
SUBTOTALS	10	90.910	250	841.74		4,798.20	5,935.80	1,787.44

Sheet No. 3

VOCATION	OFFICERS		MEN		PRO-DUC-TIVE	OVERSEAS PAY RATES		
						PROD. MEN	NON-PRODUCTIVE MEN	
	No.	%	No.	%		ENLISTED	ENLISTED	OFFICERS
Subtotal forwarded	10	90.910	250	84.174	......	4,798.20	5,935.80	1,787.44
(T) METAL TRADES DEPARTMENT	1	9.090	......	....	......	....	....	155.82
Forge	...	....	8	2.694	Yes 7	303.80	....	....
					No. 1		96.00	
Welding	...	....	6	2.020	Yes	263.40	....	....
Radiator and Sheet Metal	...	....	5	1.683	Yes 4	175.60	....	....
					No. 1		51.20	
Plumber	...	....	1	.337	No.	....	36.60	....
(W) WOODWORKING AND FINISHING	...	....	......	....	......	....	....	....
Carpenter and Millwright	...	....	4	1.347	No.	....	220.40	....
Body	...	....	4	1.347	Yes 3	124.40	....	....
					No. 1		51.20	
Wheelwright	...	....	4	1.347	Yes	175.60	....	....
Painting	...	....	4	1.347	Yes 3	139.00	....	....
					No. 1		51.20	
Trimming	...	....	4	1.347	Yes 3	124.40	....	....
					No. 1		51.20	
(S) SERVICE PARK	*1	....	......	....	......	....	....	....
Service Repair	...	....	*30	....	Yes 24	....	....	....
					No. 6	....		
Battery Service	...	....	3	1.010	Yes 2	92.00	....	....
					No. 1		51.20	
Tire Service (Work under Service Park	...	....	*3	....	Yes	....	....	....
attached)	...	....	4	1.347	Yes	184.00	....	....
GRAND TOTALS	11	100%	297	100%		6,380.40	6,544.80	1,943.26

D Filled by detail.

G Filled from Prisoner of War Guard Companies Not counted in totals.

M Filled from Medical Corps. Not counted in totals.

* From Service Park. Not counted in totals.

REPAIR UNIT PERSONNEL—DISTRIBUTION AND PRODUCTIVITY

Sheet No. 1

D means filled by details from other duties. Detailed duty is in addition to other duty.

VOCATION	OFFICERS		MEN		PRO-DUC-TIVE	OVERSEAS PAY RATES		
						PROD. MEN	NON-PRODUCTIVE MEN	
	No.	%	No.	%		ENLISTED	ENLISTED	OFFICERS
(A) COMMANDING OFFICER	1	2.1276	2	.167	No.	...	84.20	275.00
(E) EXECUTIVE DIVISION	...	...	...	...	...	...	...	...
Adjutant	1	2.1276	4	.334	No.	...	153.80	220.00
General Office	1	2.1276	18	1.500	No.	...	711.20	155.82
Personnel	1	2.1276	8	.670	No.	...	398.00	183.33
Welfare	2	4.2552	96	8.045	No.	...	4,054.60	339.15
Instruction	D	...	D	...	...	...	...	...
Security	D	...	D	...	...	...	...	...
(M) MEDICAL DIVISION	M	...	M	...	...	...	...	...
Sanitation	1	...	2	...	...	...	...	...
Prevention	1	...	5	...	...	...	...	...
Dentist	1	...	1	...	...	...	...	...
Service	1	...	8	...	...	...	...	...
(G) PRISONERS OF WAR GUARD	G	...	...	...	...	...	...	...
Welfare	G	...	G	...	...	...	...	...
Security	G	...	G	...	...	...	...	...
(U) SUPPLY DIVISION-ADMIN.	1	2.1276	10	.838	No.	...	460.00	220.00
M. T. Stockroom	1	2.1276	16	1.340	No.	...	723.40	183.33
Shipping and Receiving	...	...	4	.334	No.	...	204.80	...
Park Transportation	1	2.1276	20	1.676	No.	...	971.60	155.82
Reserve Park	1	2.1276	8	.670	No.	...	409.60	183.33
Equipment	...	...	8	.670	No.	...	380.40	...
(I) INSPECTION DIVISION	...	...	...	...	...	...	...	...
General Inspection	1	2.1276	12	1.050	No.	...	720.00	220.00
Diagnostician	1	2.1276	4	.334	No.	...	240.00	183.33
Final Analysis	1	2.1276	8	.670	No.	...	480.00	183.33
Supply Inspection	...	...	4	.334	No.	...	204.80	155.82
Repair Checking	1	2.1276	8	.670	No.	...	409.60	...
Road Test and Final Inspection	...	...	12	1.050	No.	...	532.80	...
Service Inspection	...	...	*2	...	No.	...	...	...
SUBTOTALS	14	29.7864	242	20.352			11,138.80	2,658.26

* From Service Park (Not counted in totals).

REPAIR UNIT PERSONNEL

Sheet No. 2

VOCATION	OFFICERS		MEN		PRODUCTIVE	OVERSEAS PAY RATES		
						PROD. MEN	NON-PRODUCTIVE MEN	
	No.	%	No.	%		ENLISTED	ENLISTED	OFFICERS
Forwarded from Sheet 1	14	29.7864	242	20.352	......	....	11,138.80	2,658.26
(O) PRODUCTION DIVISION	...	....	......	....	......	....	....	....
Superintendent	1	2.1276	4	.334	No.	....	154.80	220.00
Efficiency	1	2.1276	2	.167	No.	....	73.20	183.33
Schedule and Routing	1	2.1276	6	.528	No.	....	219.60	155.82
(P) MOTIVE PLANT DEPARTMENT	1	2.1276	......	....	......	....	....	220.00
Motor	2	4.2552	124	9.171	Yes 120	4,682.40	312.00	339.15
					No. 4			
Appliance	1	2.1276	20	1.676	Yes 19	920.80	51.20	183.33
					No. 1			
Machine	2	4.2552	42	3.519	Yes 40	1,741.40	147.20	339.15
					No. 2			
Axle and Transmission	2	4.2552	32	2.681	Yes 30	1,390.20	156.00	339.15
					No. 2			
Power and Electrician	1	2.1276	8	.670	No.	....	368.00	155.82
(Q) UTILITY DEPARTMENT	1	2.1276	......	....	......	....	....	220.00
Salvage	1	2.1276	60	5.028	Yes 20	668.60	2,014.20	155.82
Labor	2	4.2552	136	13.474	No. 40	....	4,874.40	311.64
(R) CHASSIS REPAIR DEPARTMENT	1	2.1276	......	....	Yes 31	....	....	220.00
Tear Down	2	4.2552	32	2.681	No. 1	1,259.80	96.00	339.15
Parts Cleaning	...	....	8	.670	No.	....	307.40	....
Riveting	...	....	8	.670	Yes	351.20	....	....
Rebuild	2	4.2552	200	15.540	Yes 197	8,023.40	216.00	339.15
					No. 3	....		
Motorcycle	2	4.2552	80	6.704	Yes 78	3,571.20	156.00	339.15
					No. 2			
Bicycle	1	2.1276	12	1.050	Yes	497.60	....	155.82
SUBTOTALS	38	80.8488	1,016	84.915		23,101.60	20,284.80	6,874.74

REPAIR UNIT PERSONNEL

Sheet No. 3

VOCATION	OFFICERS		MEN		PRO-DUC-TIVE	OVERSEAS PAY RATES		
						PROD. MEN	NON-PRODUCTIVE MEN	
	No.	%	No.	%		ENLISTED	ENLISTED	OFFICERS
Forwarded from Sheet No. 2	38	80.8488	1.016	84.915	......	23,101.60	20,284.80	6,874.74
(T) METAL TRADES DEPARTMENT	1	2.1276	......	....	......	....	....	220.00
Forge	1	2.1276	20	1.676	Yes 19 No. 1	853.20	.... 96.00	155.82
Spring	...	....	4	.334	Yes	204.80	....	....
Welding	1	2.1276	20	1.676	Yes	984.20	....	155.82
Radiator and Sheet Metal	1	2.1276	20	1.676	Yes 19 No. 1	899.80	.... 96.00	155.82
Plumber	...	....	4	.334	No.	....	175.60	....
(W) WOODWORKING AND FINISHING	1	2.1276	......	....	......	....	....	220.00
Carpenter and Millwright	1	2.1276	24	2.005	Yes 12 No. 12	443.40	.... 628.00	183.33
Body	1	2.1276	12	1.050	Yes 11 No. 1	542.80	.... 60.00	.... 155.82
Wheelwright	...	....	12	1.050	Yes 11 No. 1	488.60	.... 60.00	....
Painting	1	2.1276	20	1.676	Yes 19 No. 1	927.00	.... 51.20	183.33
Trimming	...	....	18	1.508	Yes 17 No. 1	879.20	60.00	....
(S) SERVICE PARK	#1	....	......	....	......	....		....
Service Repair	...	....	#30	....	Yes 24 No. 6	....	....	....
Battery Service	1	2.1276	12	1.050	Yes 11 No. 1	427.80	.... 96.00	155.82
Tire Service (Work under Service Park	...	....	#3	....	Yes	....	....	....
attached)	...	....	12	1.050	Yes	594.00	....	....
TOTALS	47	100%	1,194	100%		30,346.40	21,607.60	8,460.50

D Filled by detail.
G Filled from Prisoner of War Guard Companies. Not counted in totals.
M Filled from Medical Corps. Not counted in totals.
* From Service Park. Not counted in totals.

Comparative Productivity of Maintenance Organizations

104. In the foregoing tables salvage men in the Repair Group were all classed as nonproductive, while one-third of the salvage men in the Repair Unit were classed as productive. It is considered that all of the salvage men in the Repair Group should be classed as nonproductive for the reason that they are engaged in wrecking operations and upon a class of salvage work which makes it difficult to charge their time to a Work Order. In the complete Repair Unit, however, it has been estimated that at least one-third (1-3) of the salvage men can charge their time to a Work Order.

105. Without the above explanation it would appear that a Repair Group is very much less productive than the other M. T. C. repair organizations. It is less productive than the Repair Unit, because of an administrative burden which falls upon it with greater than proportionate weight. In the same connection it may be pointed out that the Service Park Unit is excelled in productivity by the Repair Section, because of the same administrative burden which causes the Repair Group to be less productive than the Repair Unit. The Service Park Unit is a much more effective unit than the Repair Section, however, because of its mobility.

106. The Service Park Unit and Repair Section, as pointed out in "Repair Methods of M. T. C.," perform duties of a service character, while the Repair Group and Repair Unit are engaged upon work which includes maintenance and extends beyond to the point of complete overhauling of vehicles. In making a comparison of the productivity of these two classes of repair facilities, it is, therefore, necessary to bear in mind the wide divergence in the class of work which they perform. Bearing in mind this difference, the four organizations mentioned may be expected to rank in productivity as follows—

Repair Section
Service Park Unit
Repair Unit
Repair Group

Trend Toward Specialization from Small to Large Units

107. The mechanic in the Service Park Unit must be a journeyman mechanic with well-developed resource and wide general experience. There is a progressive change in demand for this type of mechanic from the Service Park Unit to the mechanical specialist in a Repair Unit, particularly those assigned to Reconstruction Park duty. It will aid the personnel officer assigning recruits to organizations and shop officers called upon to adapt their personnel to changing demands, as pointed out in Paragraph 420, "How Apparent Disadvantages of Multiple Supply System Disappear," to observe how the basic trades, represented in the Service Park Unit, branch into trade specialties in the larger units. The radiator repairer either keeps to his original trade or branches into specialization as sheet metal mechanic (repairer of fenders, motor hoods, etc.) and plumber. The Table of Organization for Service Park Unit, calling for one mechanic capable of carpentry, painting and trimming, makes a demand very difficult to fill with one man. In the larger organizations this single vocation, if it may be so called, separates into carpentry, millwrighting, body repair, wheelwrighting, painting,

top making and upholstery. In a similar manner blacksmithing develops the specialties of riveting, tool dressing and drop forging. Welding develops into such specialties as oxygen and acetylene gas makers, lead burners and salvage experts. The trade of machinist branches into a great variety of specialties which may be classed under the general description machine too. operators, salvage mechanic and into the highly skilled specialty of tool making. The trade of electrical and curburetor mechanic in the Service Park Unit separates into the specialties of carburetor mechanic, armature winder, automobile wiring expert, automobile electrician, power plant electrician, lineman, battery service mechanic and battery rebuilder. The vocation of tire press mechanic in the Service Park Unit is limited in specialization to rubber salvage expert. The trade of motorcycle mechanic branches into motorcycle mechanic, bicycle mechanic and motorcycle rider. Vulcanizers are, like tire press mechanics, limited to specializing as rubber salvage experts.

108. Another phase of the changing of complexion of the units from small to large, which is quite apart from the multiple which represents the change in size, grows out of the policy as described in Chapter IV, «Repair Methods of the M. T. C.» The Service Park Units exchange parts and assemblies whenever practicable and leave the repair for the larger and better equipped parks. They must, therefore, have a proportionately larger number of chassis repair mechanics. In fact as stated in paragraph 11, the whole personnel upon occasion are chassis repair mechanics or assemblers. The Repair Units, which must make, in overhaul or reconstruction parks, the actual repairs for their own chassis repair mechanics, and those in Service Park Units, too, must have a proportionately larger number of motor mechanics, machinists and axle and transmission mechanics. Their tool kits, being all based upon the basic chassis repair mechanic's kit, there is little difficulty in making changes in assignments, when necessary, from that standpoint.

109. By careful study of these lines of ramification the motor transport officer can learn to skillfully take full advantage of the adaptability of his men, be they specialists who are called upon to develop into journeymen mechanics, or vice versa. It is especially desirable that laborers and helpers be carefully observed and given every opportunity to develop into a journeyman trade or the specialty for which they seem to be particularly suited. It should be kept constantly before the men themselves that the military service demands from the soldier, even the specialist, at the most unexpected moment, a very general knowledge and a degree of resourcefulness for surmounting difficulties. The questions which usually decide promotion for or against a man are: Has he the general experience, resourcefulness and leadership necessary for the next higher job?

CHAPTER IV

REPAIR METHODS OF M. T. C.

Definitions of Repair Chart Terms

110. The making of distinction between the industrial terms usually employed to describe the several repair methods used in the M. T. C. is somewhat difficult for the person not well acquainted with shop operations. The accompanying chart, "Repair Methods of M. T. C.," has therefore been devised to assist in visualizing these distinctions.

111. Simplicity demands that the chart be as free from statistical data and confusing technicalities as possible. It is therefore purposely drawn without attempt to do more than secure an approximation to the relative sizes of the different factors which enter into its composition. It makes no attempt to show how the personnel should be distributed between the several shop departments and functions for the reason that its purpose is foreign to professional discussion of the details of shop operation and administration.

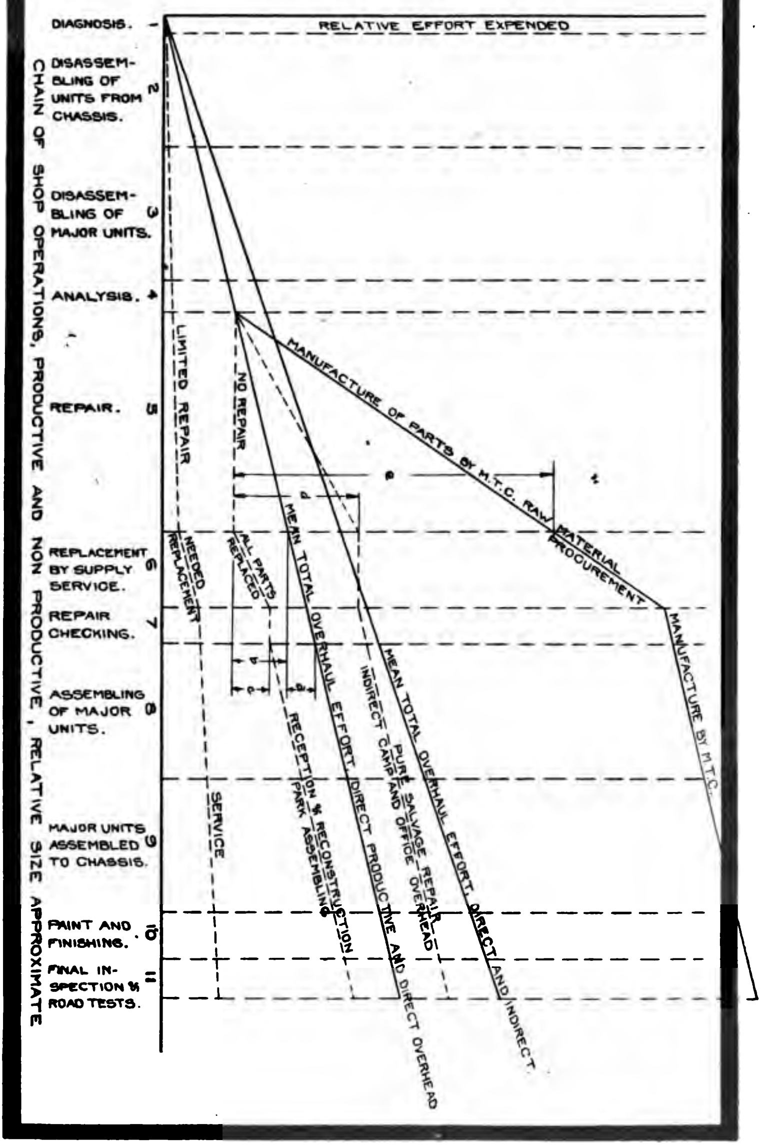
112. Its sole purpose is to picture the difference in the repair policies which may be followed in the M. T. C.

113. Along the base of the chart is shown, in their approximate chronologic order, the "Chain of Shop Operations—Productive and Nonproductive." Vertical distance represents in a pictorial sense only the "Relative Effort Expended." The different repair methods are compared to what is known as overhaul repair.

114. The following quotations from the M. T. C. Manual fixes the officially accepted definition of caretaking, service, reconstruction and overhaul:

> 57. In order to avoid any misunderstanding caused by a confusion of terms commonly used in connection with M. T. C. repair activities, the following authorized definitions of terms are given and must be carefully noted and used:
>
> (a) CARETAKING means the work of maintenance, rather than repair, exercised by operating personnel.
>
> (b) SERVICE means special maintenance of a more highly skilled character and light repair supplied by personnel not belonging to the operating organization; in other words, by the Service Park.
>
> (c) RECONSTRUCTION is rebuilding, salvage, manufacture, main overhaul (meaning overhauling with almost complete substitution of new parts) and reclamation.
>
> (d) OVERHAUL is intermediate between service and reconstruction, because it borders on each, sometimes taking almost the character of the one, then the other. Its salient features are somewhat less basic remanufacture methods and particularly the re-use of repaired parts frequently on the vehicle from which they are taken.

REPAIR METHODS
OF
MOTOR TRANSPORT CORPS
SCALE PICTORIAL



Chain of Shop Operation

115. The vehicle upon arriving is diagnosed from the reports received from its custodians, and by a careful external examination and test. The next step is to remove the body, the motor, the steering system and other so-called units. The third step is the disassembling of these major units. The fourth step is a careful technical examination or analysis of the repair operations necessary. The fifth step is repair of parts worth the cost of repair. The sixth step is supplementary to the fifth, namely, replacement through the supply service of parts rejected for repair. The seventh step is the careful checking of repairs. The eighth step is the reassembling of major units. The ninth step is the assembling of major units upon the chassis. The tenth step, painting and finishing. The eleventh step is final inspection and road tests.

Indirect Camp and Office Overhead

116. Indirect overhead labor, devoted to camp administration, welfare, military and industrial administration, forms an overhead burden which is best illustrated by a triangular space showing that its application, insofar as any particular repair job is concerned, occurs with some lag in time, and that constant effort and care is necessary to keep this class of work abreast of the industrial work to that degree which permits of both being finished at approximately the same time. There should be a similar triangle above each of the lines representing a separate method of repair, but for the sake of simplicity and clearness, this indirect overhead burden is illustrated over the "Overhaul" repair line only. The size of this indirect overhead burden is quite closely proportional to the relative magnitude of the shop operations required by each method. In other words, the divergence in expense and time shown by the comparison of shop operations is magnified when the indirect overhead burdens are added.

Service Repair

117. Accumulated statistics indicate that the average service job has required about one-fifth of the time required by the average overhaul job. This is higher than should be the case and is due to getting away from "service" toward "overhaul," because for some time much of the burden of repair fell on Service Parks alone. The service line is therefore plotted lower, in more nearly its true position. Service repair shows the same care in diagnosis as is given an overhaul job. Service is the doing of those things and only those things which are necessary. When time permits, service approaches the principle of the old adage, "A stitch in time saves nine." The repair work done in the typical service job should be limited in character, as illustrated, while relatively more parts are replaced than are repaired, because the repair facilities of the service park are limited, and because *its purpose is to turn out the maximum number of serviceable vehicles possible.*

Overhaul Repair

118. The basic line of the chart is labeled "Mean Total Overhaul Effort—Direct Productive and Direct Overhead." Any individual overhaul job would plot, now above this mean line, now below it. If the personnel of the overhaul park is perfectly distributed so as to avoid any overworking of personnel on one

phase of the shop operations while the personnel in other places is partially idle; in other words, if everything works in the smoothest manner possible, the progress of the energy expended on the mean overhaul job could be illustrated by a straight line.

119. In the "Repair" and "Replacement by Supply Service" steps there is a normal amount of each. It is in comparison with these sections of the "overhaul line" that the difference with other repair methods develop.

Salvage Repair

120. "Salvage Repair" differs from "Overhaul Repair" in steps as follows:

Step

1 Diagnosis is extended, quite inseparable from analysis,
4 and is coincident in time with sorting.

2 Sorting of salvaged parts occupies much of the labor of
3 overhaul disassembling. Limited disassembling of partially stripped vehicles is necessary.

5 Pure salvage repair means no new parts used and extreme development of repair. Dimension "d" must exceed "a" plus "b."

6 No service required from the supply department when salvage repair is complete.

Reception and Reconstruction Park Assembling

121. It matters not whether assembling of all *new parts* begin on a new frame in a base port reception park, or on a salvaged frame in a reconstruction park, this method requires no parts repair shop and no parts manufacturing shop. Dimension «c» must be greater than «a» and labor in assembling is normal. Repair checking is zero, since checking to insure the presence of all necessary new parts belongs in Step No. 6.

Remanufacture by M. T. C.

122. Remanufacture must show a dimension «e» greater than «d», since greater effort is required to cast and forge from raw material than to use forgings and castings already made. Considering the crystallization of metals and re-use of parts which may be made serviceable but not perfect by repair, it may be laid down as a fundamental rule that repair is economical only when the repair operations require less effort than the machine operations on new forgings and castings. Of the two factors of manufacturing, repair partially balances only the machine operations.

123. Development of manufacturing capacity in or near the theater of war and procurement of raw materials have proved to be matters of extreme difficulty, hence there must be conceded a marked increase of effort expended over utilization of available materials by the best expedients at hand.

Conclusion

124. Attention must concentrate on:

(a) Insuring adequate supply of factory parts;

(b) Utilizing, not merely collecting, salvaged vehicles and parts;

(c) Accepting salvage as the most expensive method which can be employed, except under the most imperative necessity;

(d) Rigorously limiting manufacture from raw materials to imperative necessities;

(e) The indefensibility of any continuous manufacturing program, since it points clearly to a failure to take effective measures in the supply service somewhere between the factory and the vehicle in use;

(f) The fact that, when main supply depots are adjacent to reconstruction parks, assembling of stripped vehicles is an easier problem than overhaul park repair with meager supplies, even when supplemented by «first pick» at salvaged parts;

(g) The fact that reconstruction parks, under condition (f) have a better prospect of keeping below the mean overhaul repair effort line than overhaul park whenever shortage of new parts must be supplemented by repair of salvaged parts and «material rustling», because of proximity of the reconstruction park to the new parts and because of their superior repair equipment;

(h) Plentiful supply to service parks of parts in accordance with M. T. C. Bulletin 59, in order that with their poor facilities, they shall not be compelled to attempt manufacture;

(i) Keeping the maximum number of vehicles in service by not attempting repair on a given vehicle when two or more others could be returned to service by shifting the same amount of attention to them.

REPAIR STANDARDIZED BY MAKES

125. Experience on the Mexican Border and in the A. E. F. has demonstrated the necessity for a standardization plan for limiting the repair work at any given park of any type to certain specified makes. Supply is greatlv simplified and production is increased in quality and quantity by this specialization. A repair program prepared by the Superintendent well in advance which concentrates for certain periods on single makes greatly increases production.

CHAPTER V

PRINCIPLES GOVERNING PARK LAYOUT

Site Selection and Layout Planning

126. The number of officers who will be called upon to select sites for overhaul and reconstruction parks and to plan the layout of park facilities will be limited. They will usually be men to whom the technical terms of construction and industrial management planning have ceased to be new. For them it is best to follow custom and approach this subject from the standpoint of a bird's-eye view and superficial examination before one becomes enmeshed in the confusion of detail. The discussion of the industrial details will be of general interest to repair park officers.

CONDITIONS IMPOSED BY MILITARY CAMPAIGN

127. Park locations and layouts are determined by the difficulties of obtaining shelter and sufficient ground area . Not infrequently the shelter is unobtainable or poorly suited to the purpose and the available sites are low, soft, exposed, poorly located and badly cut up in detached parts. The varied situations which arise may be grouped in seven classes, growing out of the types of construction to be used:

(a) Erection of new buildings on a suitable clear site; building material and design favoring industrial considerations, when necessary, at some expense to military considerations;

(b) Same as (a), except that military considerations govern, particularly in matter of construction material available;

(c) Use of existing buildings and site without change of buildings;

(d) Same as (c), except for interior change in buildings;

(e) Same as (c), but with new buildings added;

(f) Combination of (c) and (e) or (d) and (e);

(g) Utilization of partially destroyed buildings in devastated territory.

128. Class (a) can be followed to advantage at home in the zone of supply. To meet requirements closer to the theater of action, class (a) is compelled to give way to a choice between the remaining six cases. In the zone between the large main bases and the zone of the army, decision rests, almost without exception, upon the element of expediency. It is well to have an eye to conditions which favor, or can later be made to favor, industrial efficiency. However these considerations always give way before the necessity for *results now.* Class (b) therefore usually serves no better purpose than as a measuring stick by which to test the relative suitability of several alternatives arising under the last five classes.

TYPICAL OVERHAUL PARK LAYOUT

Faults to be Avoided

129. Faulty original planning lays upon the park a constantly accumulating charge, be it reckoned in money, time, or production record. Correction is usually economically impossible, hence operating personnel and development personnel not infrequently find

themselves compelled to accept the burden, and sometimes the blame, for such faults long after the identity of the original responsible party is lost. In the language of scientific industrial management the faults which must be avoided, in so far as may be practicable, are:

(a) Lack of definite flow lines for systematic progress of work;

(b) Elbow friction between human or work currents;

(c) Long errand distances for park personnel or park patrons;

(d) Frequent station stops for human or work currents;

(e) Congestion, resulting in time absorption, at station stops, including those in the currents of the park's patrons;

(f) Lack of expansion space which will permit of avoiding the above faults in the expanded park.

GUDMONT AND ROMORANTIN PARK LAYOUTS

130. As an aid in illustrating the point that a Class B plan frequently serves only as a measuring stick and the manner in which flow lines work out, the Gudmont and Romorantin Park layouts are shown. Each plan gave way to expedients which could give more immediate results. They should be studied, however, in connection with what follows.

INDUSTRIAL FLOW LINES

131. Good flow lines for the systematic progress of work require that a close study and classification be made of the different types of work to be undertaken and of the principal operations required for each in order that the degrees to which the several operations are similar and dissimilar may be definitely measured. Next there must be a careful balancing of one against the other between the man capacity, working space capacity, equipment capacity, and roadway and aisle capacity over small sections of the park in order that there shall be no overloading of one capacity with the others running on constant underload. Crossing of currents must be avoided. There must be no «bottle necks» through which the currents must pass with the inevitable eddies and countercurrents on either side. It requires constantly sustained high pressure to force any quantity quickly through a «bottle neck.» Pockets, unnecessary turns, and back currents all absorb energy.

SWITCHING WORK INTO PROPER CHANNELS

132. Separation of the different types of work into the most suitable channels is one not unlike the design of a railroad makeup yard in which the cars of a freight train are shunted on the shortest possible lines to their proper position in new trains. Easy entrance and exit and clear passages through such a yard are conditions of primary importance. One must also beware of providing too many tracks on which through cars ought not to but will inevitably stop.

RELATIVE LENGTH OF OVERHAUL PARK CHANNELS

133. The layout of an Overhaul Park is not different in its underlying principles. The party desiring information solely

should find himself able to obtain it quickly, easily and courteously and able to depart so promptly that he has little sense of having made a stop at the park for it. Gasoline, oil, grease, water and air service should be obtainable with almost equal ease. Transient convoys and single vehicles should slide in and out of a carefully prepared groove for receiving, parking, obtaining supplies needed on the road and for quartering, so that they leave with the impression that they simply turned out of the main road in the vicinity of the park. The park personnel should be almost unconscious of their stop. Vehicles needing quick service repair should find their groove but little longer than that for a vehicle that parks for overnight or for the noon-day meal. Overhaul repair work should be the first type to more than touch the fringe of the industrial area. Entrance and exit must be easy with a minimum amount of crossing of strictly industrial human or work currents. Accessories repair must have its own very direct line from the vehicle from which the article comes at the diagnostician's gate to the proper repair shop, thence to the final inspection gate, which is its appointed meeting place with this vehicle. Accessories exchange must proceed with at least the same directness. The handling of salvage repair, dismantling for salvage of parts, receipt and disposition of salvage parts may enter on the deepest lines within the park. Supply lines for all classes of material, spare parts, raw material, lumber, fuel, accessories, clothing and food must be short, starting from the railroad, docks and wagon roads, reaching storehouses centrally located with respect to the functions they serve, as, for instance, shop areas, gasoline station, fuel piles, salvage sorting platforms, camp areas, etc. The Motor Transport Stockroom must make a good compromise between serving shop areas centrally and serving the outside patron without admitting him to the shop area. The details of the movements of each class of work are discussed under the proper captions under the general heading of «Operation» below.

RELATIVE PROXIMITY OF REPAIR PARK FUNCTIONS

134. The relative length of Overhaul Park Channels having been fixed, the problem of the relative location which different shops, offices, gates, communications and utilites should have to each other appears to be a very perplexing one. It yields readily to solution in the form of the triangular chart, «Relative Proximity of Repair Park Functions.» The upper right hand triangle with spaces filled in with figures shows the «Order of Contact Desired.» The significance of the figures, from 1 to 5, employed is explained in the legend near the right margin. To find the relation which should exist between any one function, as the Welding Shop, with all others pick out the word «Welding» in the left margin. Follow its horizontal space to the right beyond the diagonal line. The relations it should bear to all those functions which appear below it in the left marginal list are found. Find the same word «Welding» along the top margin. Run downward to find the relations which the Welding Shop should bear to all of the shop functions mentioned above it in the left margin. The desired relation of the Welding Shop to everything else has now been ascertained. It is obvious that the chart has provided, in the case of latrines, fire protection, water supply, etc., for the scattering of those facilities over the industrial area. In the case of the Grinding Room, a distinction should be made between a

grinding room connected with an alloy or iron foundry and the cylinder, crankshaft and valve grinders, which are always placed in or near the machine shop. Fire hazard takes the Paint Shop away from everything else.

TESTING A LAYOUT STUDY WITH THE CHART

135. The blank lower left hand triangle may be used as a study sheet in which to enter in the proper space for comparative purposes the «Order of Contact Obtained» from any given scheme for utilizing existing plants or structures. It will not infrequently be found that a better order of contact may be «obtained» than is shown as «desired». Such a solution must be accepted with caution lest by accepting it a «bottle neck» is unconsciously created. This requires a very close study of flow lines, freedom of movement in aisles and roadways and of the proportioning of areas between functions.

PRINCIPLES GOVERNING THE USE OF PARK AREAS

136. The total site area must be allotted in very nearly fixed proportions under the following headings:

Roofed Areas
Floor Areas
Parking Space, Receiving, Service, Overhaul, Body Storage, Salvage Vehicles, Ready for Issue (R. F. I.), Convoy Makeup, Transient Convoy, Patrons' Short Errand Park
Yard Work (When Shelter Is Insufficient)
Salvage Parts Sorting Space
Yard Storage for Fuel, Lumber, Raw Materials and Overflow Stores
Road and Walk Areas
Railroad and Dock Areas
Camp Areas for Permanent and Casual Personnel
Prisoner of War Stockade and Guard Camp
Welfare Space for Drills, Athletics, Recreation, Bathing, Gardens, etc.
Expansion Space
Waste Areas (Topography and Arrangement Fix This Item)

This is nearly the same as roofed area, for the reason that upper floors can be utilized to advantage only for offices, some stores, small shops, certain welfare purposes, etc.

RATIO OF ROOFED AREA TO SITE AREA

137. The ratio of roofed area to site area usually varies from between 20% and 30% in a new industrial plant (camp and welfare areas of all kinds excluded), which provides for industrially economical growth, to 60% for one hampered by overbuilding the area and forced uneconomical arrangement. Ample space for interior roads, fire exits, industrial railroads and the other space enumerated above must be allowed.

EFFECT OF CROWDING UPON PRODUCTION

138. A careful record of the production from the M. T. C. Reconstruction Park (temporary site), Ft. Sam Houston, Tex., cover-

ing a period of over a year, showed remarkable parallelism with a square feet per man curve for the same period whenever the number of square feet per man was below 100. During this period the personnel varied from about 400 civilians to a maximum of 725 and down to a minimum of 26, while the total of enlisted men present varied between about 50 and 2,850 in the same period. The available roofed area was considerably increased during the same period. Production went up promptly with every increase in area per man and down with every decrease. When the roofed area in square feet per man was at 125 or above parallelism between the curves discontinued. The shops at Marfa, Texas, and Brownsville, Texas, showed about 400 square feet per man. This is entirely proper for small shops where the productive industrial space is relatively small in order to provide minimum office, latrine, wash room, gasoline and oil and warehouse space. The shop at Columbus, New Mexico, in July and August, 1916, showed about 90 square feet per man and was overcrowded and was compelled to do a great deal of work out of doors. The El Paso shop at Fort Bliss, Texas, in July, 1917, showed about 140 square feet per man. Crowding was noticeable and considerable work was being done out of doors. Fort Sam Houston showed a minimum record of 41 square feet per man in February, 1917. To properly house all work which requires it, about 200 square feet per man (using total number of men) seems proper. 150 square feet per man avoids undue crowding, but compels the doing of work out-of-doors, which suffers from the exposure.

PROPORTIONING FLOOR AREAS BETWEEN SHOP FUNCTIONS

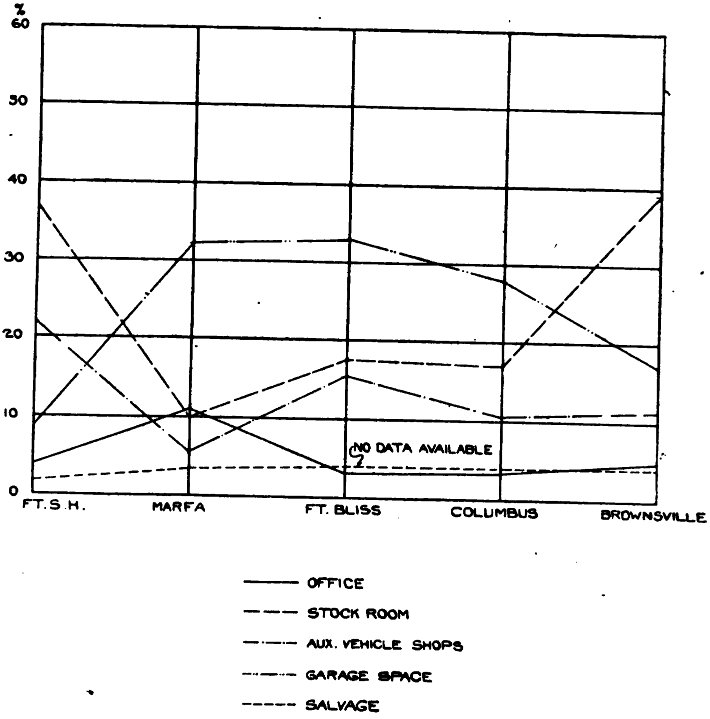
139. This is one of the most important and troublesome elements of Repair Park design. Local conditions do not affect it to the degree to which they are sometimes given credit. The best available data upon this subject appears to be the detailed «Comparison of Southern Department Shop Areas», published in Bulletin No. 23 (25 pages), September 8, 1917, at the Ft. Sam Houston Reconstruction Park. Time has not yet permitted a similar detailed comparison of A. E. F. Repair Parks. The results of this study, applied to A. E. F. experience, may be epitomized as follows:

DESCRIPTION	*Square Feet*
Office area, square feet per person, maximum, Headquarters Southern Department	80
Office area, square feet per person, minimum, temporary offices of Fort Sam Houston Reconstruction Park	32
Hygienic minimum, 12-ft. ceiling (note that this is less than barracks' allowance and that temporary offices have low ceilings)	62.5
Chassis Repair Department stalls, U. S. standardized concrete steel shops	120
Chassis Repair Department stalls in Repair Section Park at Brownsville	12
Chassis Repair Department stalls in Two-Group Park at Fort Sam Houston	36
Chassis Department stalls after inadequate increase at Fort Sam Houston	56

BULLETIN 23
INC. 6

CHART NO. 1

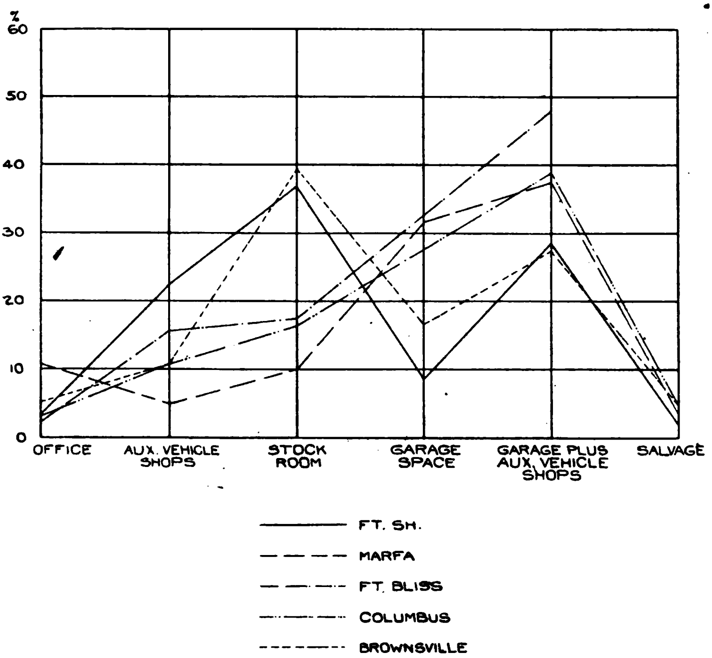
SHOWING PERCENTAGES BY SHOPS



BULLETIN 23
INC 6.

CHART NO. 2.

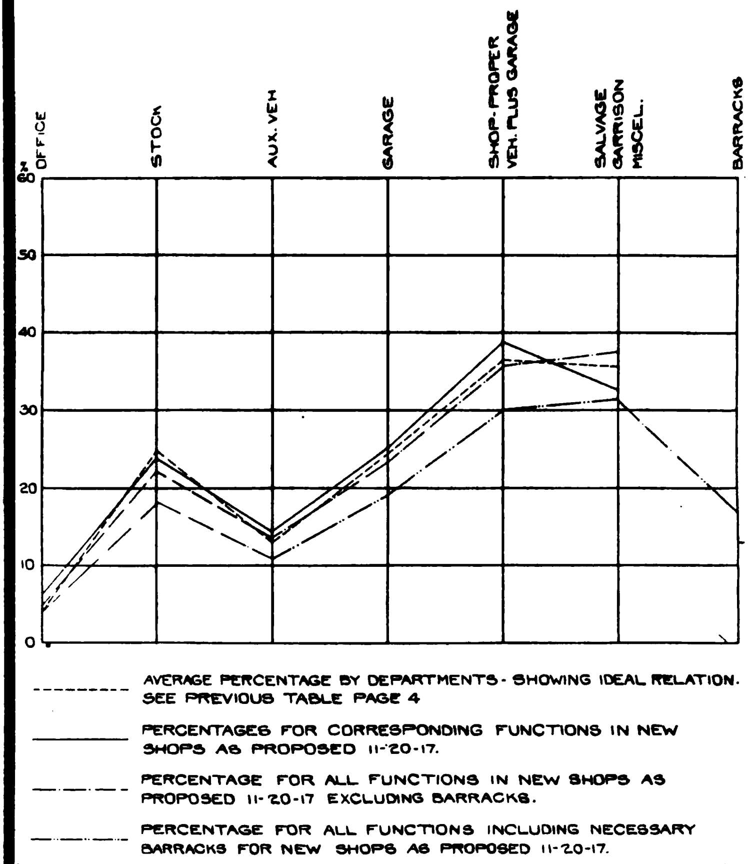
SHOWING VARIATION OF PERCENTAGES BY DEPARTMENTS



BULLETIN 23
INC. 6

CHART NO. 3

AREA PERCENTAGES FOR SHOPS



Chassis Department stalls in Two-and-One-Half Group Park at El Paso	75
Chassis Department stalls required for Repair Section Park	12
Chassis Department stalls required for Repair Unit Park	120

Area per man required for Service Park Unit Park	145
Area per man required for Repair Section Park	133
Area per man required for Repair Group Park	125
Area per man required for Repair Unit Park	125
Area per man required for Reconstruction Park	140

Roofed area for Immobile Service Park	5,000
Roofed area for Repair Section Park	10,000
Roofed area for Repair Group Park (Service Park attached)	42,500
Roofed area for Repair Unit Park (Service Park attached)	155,000
Roofed area for Reconstruction Park (three Repair Units; one attached Service Park Unit)	509,000

Industrial site area for Immobile Service Park, including roofed area	25,000
Industrial site area for Repair Section Park, including roofed area	50,000
Industrial site area for Repair Group Park, including roofed area	212,500
Industrial site area for Repair Unit Park, including roofed area	775,000
Industrial site area for Reconstruction Park, including roofed area	2,545,000

Barrack roofed area for Immobile Service Park Unit	2,250
Barrack roofed area for Repair Section Park	5,400
Barrack roofed area for Repair Group Park	25,000
Barrack roofed area for Repair Unit Park	93,000
Barrack roofed area for Reconstruction Park	300,000

140. These values are intended as a practical minimum to meet conditions in the zone of active operations. It will be seen by reference to paragraph 138, «Effect of Crowding Upon Production,» that the minimum factors have been used in determining the values in the above table. Where conditions permit, reasonable additional allowances will prove their value. Reference to paragraph 136, «Principles Governing the Use of Park Areas,» will show that no allowance has been made in the above figures for the last six items enumerated therein, nor for parking space for convoy makeup, transient convoy, and patrons' short errand park. Barrack area has been estimated on the basis of 70 sq. feet per enlisted man and 140 sq. feet per officer. The numerical strength of each type of park is indicated.

141. The exact distribution of area between each small function is a difficult thing to measure because it is necessary to distribute aisle spaces and draw many indefinite lines of demarkation between them. The manner in which this was done should be quite clearly understood by the person attempting to draw conclusions from the data. For that reason, and because of its length and the limited number who will have occasion to go that deeply

into the subject, the complete data will be furnished only on special request.

142. In the following comparison of summaries, it is necessary that the composition of each summary class be defined. Office and Welfare includes administrative space except that for General Foremen, latrine and wash room space, conference space, engineering and inspection offices, experimental space, etc. Stockroom space includes all storage space of every character including such items as lumber space, bar iron and steel racks, gasoline, oil and grease space, etc. Auxiliary Vehicle Shops means all shops and shop space which contribute to the repair of vehicles. Garage space means all stall space of whatever character, in fact all possible areas into which vehicles can be crowded for repair under shelter. Such shops as wheelwright, painting and trimming shops must be divided between the Auxiliary Vehicle Shop class and the Garage Space class. Salvage Park Shops included in the case of Fort Sam Houston Reconstruction Park some of the present Reclamation Shops for clothing and equipage. The effect of this was eliminated by the process of correction explained in the Bulletin. The Garrison Job Shops included only that space devoted to a post quartermaster's maintenance functions. The following is quoted:

SALVAGE

12. The salvage area varies in a manner exactly opposite to that of auxiliary Vehicle Shops. This would naturally be expected. Larger Auxiliary shops mean more repairing of worn or broken parts and consequently less material for the scrap heap. There is also reflected a divergence of views and policies relative to reclaiming methods. This will be discussed more in detail in a separate bulletin on Salvage Methods, in course of preparation.

GARRISON JOB SHOPS AND MISCELLANEOUS

13. As is stated in the letter of September 8, Par. 5, (to which this letter is Inc. 6) the percentage columns now add up to less than 100 in all cases except that of Fort Sam Houston. If each of these percentages is now subtracted from 100 and the difference tabulated under the heading Garrison Job Shops and Miscellaneous, the agreement is again very close. This provides an additional check on the accuracy of the method.

TABLE OF STANDARDIZED COMPARATIVE PERCENTAGES OF TOTAL AREAS

	Ft. S. H.	Marfa	Ft. Bliss	Columbus	Brownsville	Average	Ft. S. H. Proposed Plan
Office and Welfare	3.388	11.080	2.980	3.410	5.100	3.719	4.64
Stockroom	37.010	10.620	17.200	16.500	39.900	24.246	23.90
Auxiliary Vehicle Shops	20.210	5.370	15.800	10.960	11.300	12.720	14.10
Garage Space	8.900	32.400	32.800	28.300	16.650	23.790	24.90
Garage and Vehicle Shops	29.110*	37.770*	48.600*	39.260*	27.950*	36.510	39.00*
Salvage	1.432	3.400	......	4.080	4.300	3.303	32.46
Garrison Job Shops	29.110	37.130*	31.120*	36.750*	22.750*	......	
Totals	100.050	62.870	68.780	63.250	77.250	......	100.00

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*Not included in totals, since Garage and Vehicle Shops percentages are the sum of the respective Auxiliary Vehicle Shops and Garage Space percentages, while the Garrison Job Shops percentages, except for Fort Sam Houston, are simply the differences described above the table.

143. A detailed check of the areas in the United States standardized concrete steel type of shop showed remarkably close agreement with the mean figures for the five Southern Department Shops.

FIXED DIMENSIONS FOR CHASSIS STALLS, ROADWAYS, AND PARKING SPACE

144. Experience has dictated certain *minimum* value for each of the important controlling dimensions. These values are as follows:

Dimension	*Minimum Value in feet*
Height of purlin to clear truck with top bows in place	14
Clear height of doors when truck with high wooden bodies and nonremovable driver's seat tops are taken into a few stalls with special height of doors	8
Width of stalls for trucks and motor cars	12
Length of stalls, utilizing part of aisle for long vehicles	20
Width of aisle in center of chassis shop	10
Width of chassis building, with sliding or rolling stall doors, 2 rows of 20-ft. stalls and 10-ft. center aisle	50
Average floor space occupied by heavy truck, square feet	150
Average floor space occupied by motor cars and light delivery trucks, square feet	100
Stall and aisle working space remaining around heavy trucks, square feet	150
Stall and aisle working space remaining around motor cars and light delivery trucks, square feet	200
Floor and working space per truck or motor car in chassis shop, square feet	300
Average floor space occupied by solo motorcycle, square feet	18
square feet	35
Average floor space occupied by motorcycle with side car, Working space necessary per motorcycle allowing for bench space and concentration of practically all work except supply, at one point, square feet	65
Floor and working space per motorcycle with or without side car	100
Average floor space occupied by escort wagon, tongue removed, square feet	100
Average floor space occupied by escort wagon, tongue in place, square feet	120
Working space necessary per escort wagon, including large tank wagons, square feet	180
Floor and working space per escort wagon, square feet	300
Average floor space occupied by one-horse cart with thills in place, square feet	80
Working space necessary per one-horse cart, thills in place, square feet	170
Floor and working space per one-horse cart, without allowance for blacksmithing space, square feet	250
Blacksmithing space for 5 wagons or carts under actual repair, square feet	100

Road Dimensions

Turning radius of center line of truck in good order..........	25
Width of road to admit turning into stall, truck in good order	35
Turning radius of center line of four-wheel steer reduced to two-wheel steer through unserviceability.................	35
Width of single way roads from which vehicles turn into stalls or parking space	35
Width of double way roads from which vehicles turn into stalls or parking space	50

Parking Space Dimensions

Width of single row parking spaces	28
Width of double row parking spaces	50
Width of berth per heavy truck in parked rows	9
Width of berth per motor car or light delivery in parked rows	8

Passageway Dimensions

Maximum width of instructions for overall distance between guide rails which trucks may straddle, inches............	46
Minimum clearance for passage of widest dual treads, feet..	8

CONDITIONS UNDER WHICH FIXED DIMENSIONS APPLY

145. It must be clearly understood that the dimensions as given above are that *minimum* to which resort may be made in the interest of conserving every square inch of roofed area when shelter is exceedingly difficult to obtain. It means only about 60 square feet per productive and nonproductive man actually in this type of shop. Note that the figures given in the paragraph, «Effect of Crowding Upon Production,» were based upon productive and nonproductive men and that large storehouse spaces and shops requiring more open space will raise this figure for total roofed areas and total personnel. Some of the largest trucks are about 23 feet over all. By assigning sections of the shop, the boundaries of which must be more or less flexible, to different classes of vehicles, a plan can be easily arranged which will place short light vehicles opposite the few long ones that may be in the shop at any one time. The height of purlin of 14 feet allows for a double-track overhead trolley system, in central aisles, and for 12-foot doors to the stalls. Vehicles are run temporarily into the aisles just far enough to permit lifting motors, bodies, etc. If hinged doors cannot be avoided, an additional allowance of 6 feet must be made in roadways along the chassis shop for the swing of a half-stall-width door. Benches at the front or rear end of a chassis are not as satisfactory as at the sides. Twenty-inch wide benches, usable from the stall on either side, are adequate. The space below should be fitted for racking large and small parts. Working benches in center aisleways are a nuisance, because of their great distance from the sides of the chassis and because of the cross current between stall workmen and movement of assemblies and parts streams and of errand boys, etc., in the same aisleways.

146. Roadway dimensions mean that roadways must be kept clear without any accumulating of parts, boxes, assemblies, etc., along the sides of shops or parking spaces. Parking space dimensions allow for passageways 2 feet wide between vehicles, which is the minimum consistent with caretaking, inspection and avoidance of injury in entering and leaving the berth. The aisle be-

tween double rows of vehicles in park varies from less than 4 feet for the longest trucks to about 10 feet and is the minimum necessary for filling and draining radiators, inspections, etc.

SHOP FUNCTIONS WHICH SUFFER LEAST FROM LACK OF SHELTER

147. The congestion of railways and the demand upon all departments and corps in the Service of Supply for *results now*, when all supplies are short, makes the procurement of building material next to impossible. Decision must be made, then, as to what shop functions and supplies will suffer least without shelter and which may best utilize canvas hangars, paulins and like substitutes. Shop functions and supplies have, therefore, been arranged with those functions and supplies at the top which will suffer least from absence of shelter.

	Shop Functions		**Supplies**
1.	Washing Platform	1.	Vehicles
2.	Salvage Sorting	2.	Fuel
3.	Salvage Cleaning	3.	Lumber
4.	Parts Cleaning	4.	Gasoline and Oil
5.	Service Park Unit	5.	Bodies and Body Parts
6.	Body Shop	6	Bar Iron and Steel
7.	Wheelwright	7	Assemblies (well boxed)
8.	Plumber	8.	Accessories, rough
9.	Carpenter and Millwright	9.	Machinery, rough (well boxed)
10	Rebuilding		
11.	Rivetting	10.	Solid Tires
12.	Salvage Examination	11.	Tools, hand, rough (boxed)
13.	Salvage Disposition	12	Parts (well boxed)
14.	Radiator and Sheet Metal	13	
15	Tear Down	14	
16.	Axle and Transmission	15.	Accessories, fine
17	Motorcycle	16.	Tools, hand, fine (boxed)
18.	Forge	17.	Machinery, fine (well boxed)
19.	Spring		
20.	Trimming		
21.	Welding		
22.	Motor		
23.	Appliance		
24	Power		
25.	Machine		

148. It goes without saying that most of the shop functions and supplies listed are exposed only under the most pressing necessity and that every effort must be made to extemporize shelter. Supplies can be fairly well protected against weather by paint, slushing oil and other protective coatings, and by the use of paulins and tentage. The remedy against loss is the providing of suitable guards. Many things which would disappear at home are never picked up in the field. In fact, it requires a constant effort to make soldiers take care of that which they already have and a double effort to make them pick up articles they pass. Loss is more apt to come from inhabitants. As between working men in mud, snow and sleet, men are far too valuable to put them out of doors in favor of supplies. These rules are given for guidance, not blind adherence. Circumstances alter cases. The arrangement of supplies opposite shop functions is intended to have the comparative value indicated.

CHAPTER VI

TYPE SOLUTION OF PARK LAYOUT IN DETAIL

Offices, Types and Location

149. The Executive Office should be of a type suited to placing the Adjutant at the center of and in easy communication with the offices of the heads of divisions. The Commanding Officer's office should adjoin the Adjutant's office and should have a general outlook from its windows over as much of the park as practicable. The Personnel and Welfare Offices may be detached from the Adjutant's Office and located along the principal route joining the industrial area to the cantonment area. It is particularly desirable that the handling of men in considerable numbers for the purposes of receiving incoming parties, signing and paying pay rolls, consultation, making up and dispatch of details, detachments and casuals be given thought and consideration. Unless other suitable provision in the cantonment area is made for the Welfare Officer and the Chaplain, their special needs require careful study. If these offices are in the same building with the Executive, Supply, Production and Inspection Offices, men will stay away from the Welfare and Chaplain's Offices, when it should be the aim to encourage their coming. The congestion which will occur at times around the Personnel, Welfare and Chaplain's Offices is also an unnecessary source of distraction to the other offices. The Executive Offices should not be so close to the outside highways that people without legitimate errands find it easy to stop. On the other hand, it should not be difficult for persons having business with the Executive Office to reach it. At the entrance of the Main Office there should be an Information Bureau, connected by telephone, when practicable, with all offices, so that all parties will be quickly and courteously directed to the proper point for the prompt transaction of their affairs.

150. The heads of the Supply and Productive Divisions need to be in close contact with each other because of the intimate relation between their work. The chief of the Inspection Division can be best located at the repair entrance and exit gates, as described below. The heads of these divisions, like the Commanding Officer, should have a general view over that part of the park area in which they are particularly concerned. Their office force should be so disposed as to be in close contact with them and yet in such relation to the General Office that some of the General Office clerks may act as a reserve pool of administrative personnel to meet the fluctuating demands on other offices. Offices for department foremen will be so located as to command a view of their departments. Mezzanine floors are excellent for this purpose. Furniture will be limited to standing desks with one high stool for the department clerk. Telephone connections are desirable. Shop foremen will not be allowed offices.

Highway Service Station

151. A Service Station should be provided on the highway which will be in plain view of those requiring service of gasoline, oils, greases, water, air, vulcanizing repair and tire press service. Sufficient parking space must be allowed in front of the Highway Service Station to avoid all congestion of the main highway. The Service Station should be located on the line separating the public from the industrial area, so that the Service Station may be supplied from the storehouse and stockroom areas inside the fence and so that the station may also serve the Service Park and Main Overhaul Repair Shops easily and readily, without need for duplication within the shop of such facilities. It will be noted that the restricted reservation lines in the Gudmont Plant prevented the attainment of these aims to the degree that the Romorantin Park layout gave.

Highway Issue Window

152. The importance of having a stockroom window on the highway depends upon:

(a) Whether the Supply Division has repair park functions only, or park and depot functions;

(b) Whether there is likelihood of the Park Supply Division developing depot functions later.

It should not be the policy of a Supply Division intended for park purposes only, to refuse service to limited and reasonable local outside calls. It is, therefore, nearly always desirable that the Motor Transport Stockroom have a highway issue window.

Repair Entrance and Exit Gates

153. The repair entrance and exit gates should be in the most accessible locations. There should be a receiving parking space between the highway and the entrance gate large enough to care for some forty (40) vehicles at a time, so that, when a complete company equipment is turned in at the same time that miscellaneous vehicles are being received, there will be ample reception space without crowding. This parking space should not be larger, in order that there shall be no tendency to permit diagnosis of vehicles to lag.

Accessories Storage

154. After the vehicles enter the gate, all accessories, tools and magnetos in particular, must be stripped off and stored in an accessory storage space, preferably forming a part of the Inspector's building. The diagnostician disposes of the accessories, as outlined under the heading, «Departments of the Inspection Division, the Diagnostician, 'IB'.» It is desirable that the exit gate located on the opposite side of the same building in order that the inspector may utilize the accessories storage space for checking accessories returning from repair and checking them out on to outgoing vehicles.

Washing Platform

155. He also has occasion to utilize the washing platform for vehicles which have been parked on soft ground or require washing as a result of road test. The washing platform should be made of concrete about 25x150 feet in size and so located that vehicles may enter it from one long side, stopping against a

curb of suitable height through which drain holes are provided, leading to a ditch along the other long side. Such a platform will provide washing space for about twelve (12) vehicles at a time.

Service Park

156. As explained in the paragraph, «Relative Length of Overhaul Park Vehicles», the vehicles requiring service repair should move on the shortest possible line within the industrial area. The service parking space should comprise about 20,000 square feet, with an additional 5,000 square feet of roofed area for the Service Park in the center, or, at least, at the center of one side of the service parking space. The service parking space should be adjacent to the overhaul parking space so as to permit flexibility in the position of the boundary line between the two, as occasion may require. (See the last section of paragraph «Relations Between Production and Inspection Divisions».) The roofed area of the Service Park should cover all the functions of a Service Park operating alone, except carpenter, body, wheelwright, painting and trimming functions. The Service Park personnel assigned to these duties will ordinarily work in the Wood and Finishing Department. The relation of the Service Park area to the Highway Service Station should be such as to facilitate the supervision of the Highway Service Park (including both the Service Park Unit and Repair Unit personnel engaged therein) by the Service Park Unit Commander. The Service Park area should also be in close proximity to the Motor Transport Stockroom in order that the idea of prompt service repair may not be hampered by one of the most fruitful sources of delay.

Battery Service

157. Battery service needs a separate building by itself and a partition between the repair room and the charging room. The giving off of hydrogen gas from the batteries under charge, forms, with the oxygen of the air, a dangerous explosive mixture. The building must, therefore, be so situated as not to be menaced by the carelessness of park patrons, by other park personnel, by working flames, sparks or cinders from other departments and yet it must have such a relation to the accessories storage space in the inspector's building that exchange of batteries may be prompt. It must be large enough to be the storehouse for the complete stock of batteries. The partition between the workroom and the charging room is an essential precaution against carelessness and danger from the working flame required in the repair room.

Wood and Finishing Department

158. The Wood and Finishing Department should be so located that overhaul jobs leaving the washing platform after diagnosis may pass the body repair yard or shop in order that the body may be removed from the chassis on its route toward the Chassis Repair Department and may be as readily picked up by the chassis after repair while en route by the shortest practicable line to road test and final inspection. This plan permits not only the wood work, but painting and trimming to be in progress at the same time that overhaul of metallic parts is going on. This solution fortunately works out in such a manner as to place the Wood and Finishing Department area in close proximity to the Service

Park area, so that the transfer of the Service Park personnel, as described above, to the Wood and Finishing Department, proves to be an advantage rather than a disadvantage and avoids duplication of facilities. At times this arrangement will place the wheelwright at some distance from the Chassis Repair Department and from the tire press in the Highway Service Station, but the wheels can always be easily rolled, hence this should seldom be a serious matter. It will almost always work out so that the wheelwright will be about midway between the Chassis Repair Department and the tire press. The shape of the Gudmont site did not permit the attainment of the above arrangements to the degree to which they were attained on the Romorantin site. The manner in which the industrial railway was used to overcome this drawback will appear from examination of the plans.

Body Repair Yard

159. In line with the policy of doing all work practicable out of doors, in order to keep the demand for roofed area at a minimum, there is required a Body Repair Yard suitable for the storage and repair at one time of 80 bodies from the 116 four-wheeled vehicles for which the Chassis Repair Department shelter is provided, and for an indefinite number receiving heavy service repair. Two fixed post cranes are needed, one on diagonally opposite corners of the body repair yard, for removing bodies from chassis and placing them on industrial cars. Trackage is required along the ends of the yard with other tracks passing lengthwise through the yard, as shown. Cars are run opposite the vacant berth and the body skidded off onto pairs of heavy saw horses 30 inches high. There should be four rows of 20 berths each, size 7 by 12 feet, with aisles 4 feet wide between berths. This requires the tracks between double rows of berths to be placed on 42-foot centers and the tracks at the ends to be on 230-foot centers. Roadways, 25 feet wide, are required around the yard. These roadways should be, for the sides, 113 feet between centers and, for the ends, 261 feet between centers. The allotment of space below will make the derivation of these dimensions and the idea of gravelling in strips clear.

Transverse Subdivisions	
½ track and ballast	2 ft.
1 skidding space	5 ft.
1 body length	12 ft.
1 aisle	4 ft.
1 body length	12 ft.
1 skidding space	5 ft.
½ track and ballast	2 ft.
Center to center tracks	42 ft.
½ roadway	12.5 ft.
1 working space	4 ft.
1 body length	12 ft.
1 skidding space	5 ft.
½ track and ballast	2 ft.
Cen. road to cen. track	35.5 ft.
This dimension doubled	71 ft.
Center to center tracks	42 ft.
	113 ft.

Longitudinal Subdivisions	
2 times ½ track, and ballast	4 ft.
19 aisles, 4 feet wide	76 ft.
20 berths, 7 feet wide	140 ft.
2 end working spaces, 5 ft.	10 ft.
Center to center of tracks	230 ft.
Center to center of tracks	230 ft.
2 times ½ track, and ballast	4 ft.
2 times half road width	25 ft.
2 times 1-foot clearance	2 ft.
Center to center of roads	261 ft.

160. The gravelling should be 3 inches for the preliminary coating along the tracks and in the working aisles. Only the 7 by 12-foot berths may be left uncovered. The uncovered space should be rather smaller than the berth, particularly in length, in order to keep the workmen out of the mud on short bodies. The object of permitting berthing spaces to remain uncovered is solely one of expediting the time when production may begin. As time permits, the berths should be covered. The dimensions given permit of loading the bodies onto cars lengthwise, but twisting them by hand a quarter turn in skidding them off will be avoided if they are loaded the length of the body across the industrial car.

Building Shape Best Suited to Flow Lines

161. Four (4) conditions, contrary to the usual industrial problem, make a doubling back of the overhaul repair flow line better than a straight line. They are:

(a) The necessity for placing in many cases exactly the same accessories on a departing vehicle which were taken from it;

(b) Picking up the same body as was taken from the chassis in order to avoid special fitting, change of registration numbers, organization names, insignia, etc.;

(c) Saving of energy and passageway space by avoiding movement of the stripped chassis frame from the point at which disassembling is completed to a distant point, where assembling would begin if a straight flow line were used;

(d) Advantage gained by having Repair Checking, «IE», in close touch with Final Analysis, «IC», and Road Test and Final Inspection, «IF», in direct touch with the Diagnostician, «IB».

162. A flow line of this character is consistent with the comparatively deep penetration into the industrial area which is necessary to give expedition to service repair and which suits the time and space required for overhaul repair. When the disassembled parts are to move to the several points of repair and are to return for assembly to the original point, the type of building which first suggests itself is one with the face closest to the entrance gate devoted to stall space and the opposite face devoted to the repair operations themselves. Whether this is a rectangular building or a «T»-shaped building depends upon the relative areas required by the two classes of operations—assembling and disassembling on the one hand and actual repair on the other—and by the length of the flow line necessary to accomplish the operation intermediate between the first stage of the first class and the actual repair operation itself. These considerations make the «T»-shaped building the more suitable. The «T»-shaped building, however, only partially reaches the desired solution, because it does not give sufficient outside frontage for stall space. The next stage toward the solution is the «I»-shaped building, with parts flowing to a central area of intensified industry and with the bars of the «I», especially the corners, presenting the greatest freedom for prompt entrance and exit of moving vehicles. To meet the requirements of prompt service to the highway issue window and of equally good service at the point of substitution of new parts for old, it is necessary to change the «I»-shaped building by the introduction of a wing, which makes one side of the «I» into a letter «H» shape. Small, light vehicles, such as motorcycles and bicycles, need touch with the repair shops and

particularly with the stockroom, but the work on these vehicles has no direct connection with the work on motor trucks or motor cars. It forms by itself a distinct thread of the vehicle current. The Machine Shop, being a shop which receives work from all other shops as tributary points, deserves a central location opposite the shop stockroom issue point. But the Machine Shop requires light to a greater degree than do many other shops. It is favored in both of these points and provisions made for the Motorcycle Shop by the addition of a new central wing opposite the stockroom wing. The effect of this is to produce a building of the «double E» type, with the Machine Shop located next to the stem of the «double E» and with the Motorcycle Shop in the outside end of the Machine Shop wing.

Test of Suitability of Shape of Building

163. Geometric study to determine minimum distances between centers of areas shows that this arrangement conserves in a most satisfactory degree that choice of shapes of areas proportioned to the requirements of different shop functions which shorten flow lines and errand distances and at the same time provide adequately for «dead chassis» storage space. In other words, the areas allotted to different functions must not only stand in proper sequence along flow lines, but the areas must possess that proximity which cuts down flow line distance and miscellaneous errand distance from point to point. «Dead chassis» storage space is necessary, because it is not permissable to give shelter to a repaired frame awaiting the return of non-interchangeable parts at the expense of curtailment of production through delaying the beginning of disassembling of other vehicles or retarding disassembly because the «dead chassis» exposes workmen to either hot sun or cold, inclement weather. «Dead chassis» storage space must be near at hand. It may be limited in quantity, because, when parts are interchangeable, effort is not made to replace them upon exactly the same chassis. This is provided by utilizing the 15-foot strip along both sides of the Machine Shop wing and the Stockroom wing at those points where passageways are not blocked. «Dead chassis» from stalls on the outward faces of the chassis wings use portions of the overhaul parking space across the entrance roadways. This leaves on both the inner and outer faces of the chassis wings the necessary thirty-five (35) feet of minimum turning space to enable vehicles to enter the stalls

Chassis Repair Department

164. In line with the statement under the heading, «Conditions Under Which Fixed Dimensions Apply», relative to assigning certain sections of the Chassis Repair Shop to different classes of vehicles, the outer faces of the chassis wings should be assigned to the large, heavy vehicles, while motor cars and light trucks should come to the inside faces. This plan calls for a division of the Chassis Repair Department personnel and of final analysis inspection. The division of the Chassis Repair Department personnel is not an objection, because it is so large that sub-division is essential to successful management. There is no great sacrifice in any direction, except that the head inspector, Final Analysis and the Chassis Repair Department foremen have some little distance between the two divisions of their work. This marked line of division in their respective departments can be turned to account by standardizing the makes of vehicles received in each wing.

Motive Plant Department

165. The Motive Plant Department is held together, except for the Power Plant and park electrician, which are best placed when separated from the other shops of the department.

Metal Trades Department

166. The Metal Trades Department is held together and has between it and the Stockroom the bar, iron and steel storage, located at the end of the industrial track running along the side of the Stockroom wing.

Disadvantages Accepted in Rectangular Building

167. The first Romorantin Park layout provided for the use of the «double E» type wooden building, similar to the Gudmont building. The dimensions of this building were the same as were commonly used for the Southern Department Shops and corresponded to the Bureau of Construction and Forestry «Type C» building. The double rectangular steel trussed building shown on the Romorantin Plan having become available, the plan shown was worked out to utilize it. The disadvantages accepted were:

(a) Part of the roofed area available had to be used for sheltering driveways to the stall spaces

(b) The width of aisle and length of stall compelled vehicles to be run in in herringbone style, instead of perpendicular to the alleyway, with consequent loss in capacity.

(c) Vehicle currents cross the flow lines of assemblies and parts in the ten-foot alleyway.

(d) One vehicle could block both the vehicle current and the assemblies and parts current.

(e) Assemblies and parts flow lines were badly confused.

(f) There was similar confusion in the vehicle current.

(g) Flow lines, when doubling back upon themselves was considered, were longer.

(h) The extra expense of wide roof span was unnecessary. (This would apply only when determining the type of roof span to be used as a matter of policy.)

(i) Excavation on an uneven site would be greater, thereby delaying construction, since the wings of the «double E» type building need not be at exactly the same level. Grades in the industrial track can be accepted within the «double E» type building almost as readily as outside of it.

(j) The proportion between stall space and repair unit strength was reduced from 116 to 60.

(k) To increase the number of stalls by increasing the length of the rectangular building, the errand distance and flow lines would become excessive. The «double E» type building occupied the same site on the original plan as the rectangular building on the plan shown.

Salvage

168. The Romorantin Plan serves to illustrate the details of salvage operations and flow lines. Vehicles to be salvaged, received by rail, were to be unloaded at the east end of the railroad spur. The salvage of wooden parts was also handled at this place. Salvage vehicles arriving by wagon road could turn directly off the road into the «vehicles for salvage area». When salvage parts were received, either by rail or by truck, they were

to be unloaded from the railroad car or from the truck (in the same roadway in which the siding ran) onto the sorting platform. These platforms were to be so constructed as to admit three industrial cars between each pair of platforms. The cars were to run under removable hopper boards, so that the sorting gang working on the platform would have three hopper-shaped holes on either side of their platform into which to toss parts without danger of parts falling between cars or between platforms and cars. This arrangement permitted the making of six different classifications in the salvage sorting operation. The number of classifications could be increased by transverse partitions in the car bodies and by increasing the number of removable hopper boards. Parts which were worthless, except for their value for old iron, were to be classified in the sorting bins, shown at each end of unloading platforms, according to classification as cast iron, common steel, machinery steel, alloy steels, etc. It was expected that the salvage personnel would be able to build from salvaged materials suitable electric magnets for economically reloading this scrap from bins into outgoing cars; also for unloading this material from industrial cars into the proper storage bins. Brass, bronze, aluminum and other alloys would be separately binned or handled in an alloy foundry for which space was left in the «Y» between railroad spurs. Junk material would be dumped at the point indicated for the junk pile. Parts that could be used without repair would go at once to the parts depot or to the stockroom. The number of parts requiring repair would proceed as described in paragraph «Disposition of Salvaged Parts.» To facilitate this work there would be reclassification bins in the six spaces between the parallel industrial tracks leading away from the sorting platform. The repair operations on parts marked with blue paint for slight repairs would be conducted in that part of the salvage building in which the words «salvage building» are shown. After inspection, they would be evacuated by the industrial railroad, either to the storeroom or to the parts depot. This plan, except for railroad connections and sorting platforms, was tested out successfully for several months at Fort Sam Houston, Texas.

Storehouse

169. In order to understand the requirements of the Supply Division, the following paragraphs should be studied:

Paragraph 34, «Supply Division»
Paragraph 38, «Departments of the Supply Division»
Paragraph 247, «Spare Parts Service in a Shop»
Paragraph 267, «Tool Service in a Shop»
Paragraph 270, «Regulations for Shop Transportation»
Paragraph 152, «Highway Issue Window»
Paragraph 154, «Accessories Storage»
Paragraph 157, «Battery Service»
Paragraph 161, «Building Shape Best Suited to Flow Lines»
Paragraph 166, «Metal Trades Department»
Paragraph 176, «Cantonments»

—and all of the chapter on «Equipment».

170. The storehouse, as distinguished from the stockroom, is the building for housing small motor transport parts in unbroken boxes, excess assemblies, wheels, tires and heavy parts over the day-to-day requirements of the stockroom. It is the overflow reservoir for motor transport stock and the place for receiving and

shipping. When an Overhaul Park is called upon to ship broken lots of parts or accessories, they will frequently be obtained from the broken stock in the bins, assembled and packed in the storehouse. It will be noted that the Gudmont storehouse and the Romorantin parts depot do not have a floor at railroad car floor height. The shortage of building material will not admit of such a convenience. The industrial railway is utilized to overcome this disadvantage by having it parallel the railway spur so that the industrial cars become the unloading platform. The cars may pass either around the storehouse or through it, depending upon the destination of the stores. It is very frequently impracticable to determine whether a storehouse of this character will be simply an overflow storehouse for the park or will, upon short notice, have to develop into a depot of considerable size. Adequate expansion space must, therefore, be left in the vicinity to provide for any possible future needs. It will be noted that very liberal provision was made for this, both at Gudmont and Romorantin. In the early stages of the development of a new overhaul park this storehouse may, upon pressing demand for shop space, be utilized for repair work when it can be clearly foreseen that adequate provision for supplies will be made elsewhere. Adequate supply space has always been the weak point of every park thus far constructed, not even excepting the Brownsville shop, which had nearly 40% of its roofed area, counting some available depot area, devoted to the storage of stock, raw material or supplies in some form. Fort Sam Houston, with 37%, was short all of the time in meeting its duties as a general supply depot.

Shipping Room Fixtures

171. The shipping room should be provided with as many shipping benches as may be required, built after the following plan: Depth, 3 feet; overall length, 16 feet; height about 30 inches, subdivided into five lower compartments and five upper compartments and open on one side only. The upper compartments are to consist of transverse division boards joined to 12-inch high back board and covered at the back with a 12-inch wide shelf board supported by the back board and the transverse partition board. The transverse partition boards should be cut on an angle from the shelf board down to a height of only about 2 inches at the front of the bench. The center upper and center lower compartments should be utilized for packing materials. The lower compartment should be sub-divided into suitable compartments so as to hold short boards, burlap, excelsior or straw and such tools as nail pullers, box scrapers, hammers, hatchets, screw drivers, box chisels and short pieces of 2-inch gas pipe for rolling boxes. The upper compartment should be sub-divided so as to hold nails, screws, boxstrapping iron, packing paper, twine, bagging needles, packers' slips, marking pot, stencils, stencil brushes, etc. The other compartments, upper and lower, should be serially numbered or labeled so that they form collecting places for all of the supplies being gathered from various parts of the storehouse or stockroom for shipment to a single point. All shipping orders, which are to be combined, must be given the compartment number so that all concerned may be informed as to the collecting point for that shipment. Shipping is also very much expedited by standardizing the box sizes to be used and by having salvaged boxes, or, when necessary, new boxes made in knocked-down form, ready at hand for the use of the packers. It is usually advisable

to have the knocked-down boxes assembled in reasonable quantities, ahead of the demand, in the Carpenter Shop, «WA», rather than in the Shipping Room.

Stockroom, Bin Stock and Assemblies

172. Efficiency in the Stockroom depends very largely on the care with which the location of stock is worked out prior to construction and shaping construction especially to meet those needs. The material handled through the shop issue window and that handled through the highway issue window should be carefully studied in order to determine those articles for which the demand is most frequent. It is not a question of the relative quantities of different supplies issued, but a question of how many times a demand is made for a given thing at a given window and the number of errands which must be run by the stock men from the window to the bins and back and how long those errands are in inches and seconds, which should determine the location of stock. When each man is issued his individual tool kit, the window demand for tool issue against the workman's brass check is not frequent. The frequency of shop demand ranges about in the following order:

Parts Common Class

Stove Bolts
Carriage Bolts
Cotter Pins
Washers
Nuts
Oil Cups
Grease Cups
Brake Bands
Gaskets
Cap Screws
Wood Screws
Machine Screws
Small Electrical Parts
Priming Cups
Pet Cocks

Spare Parts Class

Wheel Bearings
Small Motor Parts
Fan Parts
Pump Parts
Differential Parts
Transmission Parts
Clutch Parts
Steering Parts

Supplies

Waste
Abrasive Materials
Welding Supplies
Sheet Metal Supplies
Battery Parts
Paint Supplies

173. Accessories are in much more frequent demand at the Highway Issue Window. This leads to the placing of all very small, fine parts common into either revolving cabinets containing usually 96 small drawers, or some substitute for them where they may be reached directly from the issue window itself, the placing of the larger, heavier parts common in the order named, measured from the issue window, in suitable bins, usually about 10x10 inches in size. The spare parts should be segregated by makes in similar stacks of bins, the location for the stock of particular make being determined by the relative frequency of demand for that stock. The stacks of bins are usually made 20 inches deep at the base up to a height of about 30 inches from the floor, then 10 inches deep as high up as it may be convenient to run the stock. If the stacks are run higher than ten or eleven feet, it is advisable to place double plank platforms at a height of about 10 feet about 20 inches wide in the center of the aisle space between two stacks. Solid platforms cut off the light and are unnecessary. The stacks are usually placed back to back so that the floor space occupied for two stacks is about 3 feet 4 inches in depth by 6 feet long. As many five or six-foot sections can be placed end to end as space

permits. The aisleway between should be not less than 32 inches wide, with windows spaced so that the aisleway is lighted. In order to utilize sheltered space to the maximum advantage, it is necessary that the supply of revolving 96-drawer cabinets, or substitutes therefor, and partitions for subdividing the 10x10-inch bins be present in ample quantity. If the sections are carefully made so that the bins are of uniform size, material for partitions may be cut and used wherever required. Where the widths of bins vary slightly it has been found practicable to take blocks of suitable width and cut them into halves with a slanting vertical cut in such a way as to form wedge blocks so that the wedge shape may be used to give them a tight fit. The two parts are then cut at the proper point so that they completely fill the width of the bin. Unless some such steps are taken it will be found that something like half the bins have so little in them that they may be subdivided, either vertically or horizontally, and sometimes both ways, so as to leave ample space for the stock in them and ample hand space for reaching the stock. Where the bins are filled half full or more, it is desirable to have all of them faced with an inch strip about three inches high. Bins of the character described may be easily improvised from scrap material. A very good substitute for these bins has frequently been constructed by taking small boxes of uniform size and stacking them one above the other, subdividing them when necessary. When it is necessary to move bin stock from one place to another this is by far the most feasible plan. A few light strips nailed to the boxes hold them together in the form of a stack. By pulling off these strips and putting covers on the boxes, the bin stock is ready to move. When these boxes are not too large they are strong enough to stand the weight of the stock during the move. This is the easiest and quickest method of establishing a bin stock in a new overhaul park.

174. Specially constructed racks are necessary for the care of uncrated assemblies, and are desirable for even the crated assemblies, in order that roof space may be conserved by utilizing the available vertical storage space, and the assemblies may be so classified and separated that the proper one may be quickly obtained without constant unpiling and repiling.

175. It is not at all infrequent that resort is made to construction of new storehouses, even when a great shortage of building material exists and time is pressing, when a better solution by far than carpeting the floor of another storehouse with one layer of stores could be attained by the simple and cheap alternative of using for proper bins, shelving and racks, a fraction of the material required for a storehouse. Concentration of supplies, shortening of errand distances and flow lines, availability of supplies, and superior control over them with greatly reduced personnel, are advantages so obvious as to make it seem a waste of space to enumerate them, had not long experience shown that the value of the cubical space above the one layer of stores in a new storehouse is not grasped and that it is frequently next to impossible to get authorization for the essential interior construction.. When the interior construction is pronounced completed by men who appreciate its necessity, it is not at all infrequent to find only the lower fifth or the lower tenth part of the cubical space in bins, racks and shelving occupied. This space may all be used to the very best advantage so long as ease of handling the stored supplies is given proper consideration. Each article like pneumatic tires, springs, axle housings, spare motors, steering

columns, etc., require their own special type of rack. A little ingenuity will easily devise plans which give concentrated storage and yet preserve the necessary facility for getting at the articles themselves. In no other way can a supply officer know what he has on hand, of what he is short, and what is not moving rapidly. When such facilities are not available, it is necessary to have recourse to complete dependability on a card system for information and to enormous labor gangs for piling and unpiling to get stores and to verify the correctness of the cards. No card system, however perfect, or any other scheme can approach in efficiency having articles so classified that they can be readily seen and readily obtained. The surplus stock at the bottom of the pile, that someone else needs, never moves for the reason that there is only labor enough available to get part of the articles out of the bottom of the pile of boxes that are needed for local use. It is not infrequently quicker to obtain parts pressingly needed from a source of supply at some distance, than it is to «dig for them» in a large dump. No supply men would be guilty of resorting to such methods, if given the only adequate and proper means of correcting them.

Cantonments

176. The cantonment area should be surrounded by suitable roads and provided with adequate gravel walks to keep men out of the mud. The recreation buildings, post exchange and mess halls should be centrally located for groups of barracks intended for the housing of 1,200 men or less. When a larger number is to be housed it is advisable to have the mess halls separately located in the center of barrack groups. Latrines, bathing facilities, clothes washing facilities, and wash racks for washing the hands and face, should be provided in adequate quantity and so scattered through the barrack area as to prevent undue crowding or exposure in going to and from these facilities. The storehouse for Equipment Department, «UF» should be located in the cantonment area. For information as to its contents, see paragraph 43, «The Equipment Department, UF.»

177. Athletic and drill fields should be located in reasonable proximity to the cantonment area, for experience has demonstrated over and over again that drill and athletic exercises are an essential factor of the training of the repair park soldier and are the most fruitful source for obtaining that *esprit de corps* and pride of organization without which the topnotch of efficiency cannot be obtained.

CHAPTER VII

CONSTRUCTION. DETAILS

Comparison of Canvas Shelter with Extemporized Wooden Shelter

178. Referring to paragraph on «Shop Functions Which Suffer Least from Lack of Shelter» (Chapter V), those shop functions which can best utilize canvas hangars may be determined from the following comparison: Experience has shown that the canvas hangar, when available, makes a very portable and quite satisfactory substitute for the housing of practically all shop functions and supplies. Its advantages were small shipping bulk and weight, which made it available where needed quite aside from all questions as to relative availability of ordinary construction materials and canvas at home, and a translucent quality which made it much lighter for shop operations than extemporized buildings with wax paper and cloth in limited area substituted for glass. The hangar has the disadvantages of high first cost in comparison to durability, it affords an imperfect shelter against raw winds, is difficult to secure against wind damage, and cannot be heated in cold weather. It also requires separate structural provision for suspending differential hoists, line shafting, etc. It cannot rise out of the classification of a substitute.

Natural and Artificial Lighting

179. Both shelter and light being necessities, a compromise must be struck between them, particularly when glass substitutes must be used. Warmth and comfort are necessary to maintenance of health, spirits and production. They go with good shelter for a certain distance and then demand light. This is especially true in high latitudes in fall and winter. The degree to which other considerations are sacrificed for light is shown by the acceptance, after all roofs were provided with vertical lighting strips in monitors, of eight-foot high stall doors (see table of Fixed Dimensions for Chassis Stalls, Roadways, and Parking Space) for the sides of chassis shops in order to have above the doors a 2½-foot wide linen lighting strip. Provision was made for sufficient high doors in gable ends for vehicles which could not enter the eight-foot high doors. This meant blocking the alley space in front of the stalls most distant from the center of the shop with the high vehicles when they happened to be in for overhaul. It interfered with shop currents only to the degree occasioned by the temporary blocking of end stall spaces. Artificial lighting is essential for all activities. When military conditions require the careful sheltering of all exposed lights, no artificial provisions can be made for out-of-door operations. When natural light fails they cease until the faculty of working in the dark develops. Artificial lighting plans must consider whether the glare from each light is an objection, and how it may be cut off when occasion requires.

Water Supply

180. The water supply plan must provide in cantonment and camp area for kitchen, latrine, bathing, clothes washing and post exchange requirements. In parking areas, provision must be made for filling radiators. Similar provision must be made at the gasoline, oil, grease, water, air, and tire service station. Water is required at the washing platform, at parts cleaning vats, in Salvage Cleaning, «QB,» and Chassis Repair Parts Cleaning, «RB,» for filling radiators in Rebuild Shop, «RD,» at motor testing stands in Motor Shop, «PA,» in Forge Shop, «TA,» Spring Shop, «TB,» Radiator and Sheet Metal Shop, «TD,» Wheelwright, «WC,» Service Repair, «SA,» Tire Service, «SB,» the separate building for Battery Service, «SC,» Park Transportation, «UD,» Reserve Park, «UE,» and for office, power house, latrines, and wash rooms. The places at which fire provisions are needed may be obtained by a study of the «Fire Protection» line on the chart, «Relative Proximity of Repair Park Functions» and the layout plan for the park under construction. Latrine and washroom locations are similarly determined.

Types of Floors Required for Different Purposes

181. The offices for the Executive Division and its branches, the Supply Division, Inspection Division, the Production Division, Prisoner of War Guard Division and Medical Division, should be supplied with wooden floors. The Painting Shop, «WD,» in overhaul parks of repair unit size, should be equipped with a wooden floor, if practicable, or a concrete floor, at least, sufficient in size to permit the painting of at least four (4) motor cars and four (4) motorcycles at a time under conditions which will give reasonable protection from dust. Wooden floors are highly desirable but not essential in all climates for barracks, post exchanges, recreation buildings, kitchens, mess halls etc. Immobile Service Parks and parks manned by Repair Sections may operate their machinery on timber skids of suitable dimensions. The machinery for parks manned by Repair Groups or Repair Units should be set on concrete floors. As a temporary measure, when cement is not obtainable in sufficient quantities, the power equipment and machinery may be set on concrete foundation blocks, which should be connected up later by a concrete floor. Concrete floors are desirable in the following places: Battery Service Building, «SC,» Tear Down Space, «RA,» Appliance Shop, «PB,» Motor Shop, «PA,» Axle and Transmission Shop, «PD,» Shipping and Receiving Department, «UC,» the bin stock portion of Motor Transport Stockroom, «UB,» and Equipment Storehouse, «UF.» Tamped gravel floors, at least three inches thick, should be provided in all other shops unless the character of the soil is specially adapted to heavy traffic and does not gather and retain moisture. Coarse gravel for floors can be used only for lower layers. Hurried dumping of unscreened gravel means an ultimate loss of considerable time because the heavy gravel so greatly interferes with the movement of warehouse trucks, and even walking, as to compel the early raking off and picking up of the heavy stones. In the stall spaces of the Chassis Repair Department, «R,» the central space, 8 x 20 feet in size, should be given a minimum first thickness of six inches in order to stand the heavy traffic from incoming and outgoing vehicles. It is advisable to dig a trench along the faces of the Chassis Repair Department, «R,» building devoted to stall space,

of such proportions that, for a distance of two feet inside the door and four feet outside the door, there is a depth of heavy gravel of not less than twelve inches, with a three-inch coating of fine gravel on top. The levels for the building itself and the gravel floors should be so determined that operation of the shop may begin immediately after the first coatings of the gravel are applied, leaving space for a second coating of not less than three inches to be applied when time permits. This total ultimate thickness is suitable for average soil, when well drained.

Power Plant and Machinery Foundations

182. Concrete foundations must be supplied for any detached power units or machinery in addition to those described in the above paragraph. Foundation blocks will be required for the tire press in the highway service station, for the wood-working machinery in the Carpenter and Millwright Shop, «WA,» for forges and power hammers in Forge Shop, «TA,» for forge and oil furnaces in Spring Shop, «TB,» for heavy sheet metal machinery, when supplied, for Radiator and Sheet Metal Shop, «TD,» for special machines in Salvage Disposition Shop, «QD,» and for the vehicle washing platform. Concrete foundation blocks are desirable for the radiator cold water testing tank in Radiator and Sheet Metal Shop, «TD,» for the cleaning vats in Parts Cleaning, «RB,» Salvage Cleaning, «QB,» and for the weighing scales of Shipping and Receiving Department, «UC.»

Working Pits vs. Elevated Runways

183. In the early stages of motor transport repair experience everyone seemed to desire working pits. Practically all of those which were constructed appear to have been abandoned after short use. It is nearly always necessary to make them of concrete. They are open to the objection that they are very hard to drain, are uncomfortable in which to work, are a death trap to workmen in case leaking gasoline catches fire, and are, in fact, required for but very few operations. The timber runway, built with a removable incline approach and at such a height as to raise the vehicle thirty (30) inches off the floor, seems to be a much better solution. A number of cantonment shops were built in the United States with four such runways. It was found that three runways were a nuisance and that there was little use for the other one. One such runway built in 1916 in the Brownsville Shop was ample. It was used about one-half the time only. Two of the spare runways from Camp Logan were brought to the San Antonio Reconstruction Park and were finally sunk part way into the ground as a substitute for washing platforms.

Overhead Trolley System vs. Industrial Railway System

184. The overhead trolley system is distinctly superior to the industrial railway in all interior shop work, because it possesses the added value of furnishing in connection with differential chain hoist a power hoist of sufficient capacity at any point reached by the trolley system. The disadvantages of the trolley system are:

(a) Increased strength required in roof construction;

(b) Increase in the number of vertical posts required in the interior free space of the shop, unless considerable expense would be accepted under condition (a);

(c) Difficulty in carrying the trolley system across roadways between buildings;

(d) Difficulty of procurement as a special article of supply in the theater of war, as compared with industrial railway which must always be present;

(e) It does not possess the same facility for connecting up with light military railways.

Points Requiring Trolley or Industrial Railway Service

185. The several shop points, which require either trolley or industrial railway service, are clearly indicated on the Gudmont and Romorantin plans. The use of gravel floors on new sites, usually having very soft soil, renders the industrial railway system an essential part of overhaul or reconstruction park equipment. The lack of it, as a regularly established article of equipment for repair (reception) parks, has been very keenly felt.

Roadways and Parking Spaces

186. The first essential in securing proper roadways and parking spaces is to determine upon such an arrangement of roads that the traffic will, as far as practicable, move in one direction, and on the shortest practicable lines for the attainment of the purpose intended. The second essential is the establishment of suitable drainage lines so that surface water will be promptly carried away. The composition of the roads and parking space paving layers depend largely upon the character of the soil and the natural drainage. In some cases as little as four inches (4 in.) of gravel on parking spaces and six inches (6 in.) on roads will suffice. Some cases have been encountered where eighteen (18 in.) inches or more of gravel did not give the necessary foundation. When six to eight inches on parking spaces and ten to twelve inches on roads is insufficient, the fault usually lies in failure to provide suitable drainage before the gravel is put on. For dimensions required for roadways and parking spaces see the Gudmont and Romorantin plans, and paragraph 144, «Fixed Dimensions for Chassis Stalls, Roadways and Parking Space.» The extent of the parking space required in a park depends upon its relation to convoy routes, as well as upon the size of its repair facilities. Each situation must be determined upon its merits. The minimum parking space, exclusive of roadways, required for strictly repair purposes may be taken as equivalent to the roofed area devoted to repair purposes in the park. This amount will provide sufficient space for the receiving park, the service parking space, the overhaul parking space, the body repair yard, vehicles for salvage park and ready for issue park.

Power Plant and Functions Requiring Power

187. The nature of the power plants required and their capacity is indicated in the Tables of Equipment in Chapter XII. Power should be purchased from local sources whenever practicable, in order to save the construction time required for procurement and installation of power plant equipment, and, in the interest of general economy of fuel supply. Small power plants are not economical in the use of fuel, particularly of gasoline. Generating power from gasoline is one of the most expensive means of obtaining power. Its use is required by orders to be limited to

the minimum consistent with the efficiency of the service. Whenever practicable, gasoline motor generator sets should be utilized for reserve units for generating power in emergency. The power requirements for the several shops may be determined from the equipment list and from the suggestions contained in paragraph 182, subject «Power Plant and Machinery Foundation,» and paragraph 179, «Natural and Artificial Lighting.»

Fences

188. Fences are essential to carrying out the plans for operating the park, as outlined under paragraph 133, «Relative Length of Overhaul Park Channels,» paragraph 134, «Relative Proximity of Repair Functions,» and the first four (4) paragraphs of Chapter VI. They should be at least five feet high and as near non-climbable as possible.

CHAPTER VIII

DATA REQUIRED FOR STARTING M. T. C. REPAIR PROJECTS

General Instructions

189. The data listed below will be submitted with all proposals for installation of M. T. C. repair facilities. Existing facilities must be used wherever practicable. This data is essential to dispose intelligently of questions affecting power installations, line shafting and other important details.

190. The portions of the data required for new projects by Par. III, Bulletin 30, Hq. S.O.S., 2nd September, 1918, covered below will be submitted on this form, or attached sheets, reference being made to the form by (a),.(b), etc.

Plant Description

(a) Town, A. P. O. No. and Section..........................
(b) In what stage is procurement of proposed site?..............
(c) State whether Reception, Overhaul, or Service Park (mobile, semi-mobile or fixed) is recommended........................
(d) Open site space, sq. ft.....................................
(Number each available building and by numbering answers to questions below cover each separate building)
(e) Floor space, sq. ft. ....
(f) Construction (Material) ....
(g) Is special construction necessary for line shafting or special special wiring for electric drive?...........................
(h) Give gauge of power lines ....
(i) How many windows must be installed to give proper natural lighting? ....
(j) How many 25-watt lamps for general lighting?..............
(k) How many 50-watt lamps for special purposes?..............
(l) Kind of floor? ....
(m) Will any demolition of existing facilities be necessary? ....
(n) Estimate amount of damage claim ....
(o) Heating facilities of Shop and Barracks ....
(p) How far is nearest Railroad? ....
(q) General 'nformation (state elevation of shop floor relative to roads, railroads, and drains and as to proximity of vehicle park and general relations to center of Motor Transport activity) ....

Power Data

(r) Sources and kind of power ....
(s) Quantity ofpower available in K.W............ Voltage.....
A. C. or D. C. ....Cycles and Phases if A. C. ....

General Data

(t) Organization and convoy routes served ....

(u) How many vehicles report for Repair (Daily) ....
Trucks.......... Motor Cars..........Motorcycles.........
Wagons .... Misc. (describe types) ....

(v) How many vehicles repaired (Daily) ....
Trucks.......... Motor Cars..........Motorcycles..........
Wagons .... Misc. (describe types) ....

(w) How many men now working (daily average) ....

(x) Is additional personnel needed? ....If so, show on attached list by needed vocations required.

(y) Give on attached list, the machines and hand tools available, quoting electrical data, sizes, etc., where necessary.....
....
....
....

CHAPTER IX

OPERATION

Inquiries for Information

191. A large sign with the word *«Information»* painted thereon should be placed at the office of the Diagnostician. A clerk who is familiar with general shop procedure, location of the different departments, gasoline, oil, water and air service stations and other general information relative to the park, must be in the office of the Diagnostician in order to direct persons to the proper places for prompt transaction of business.

192. Signs should be painted showing the location of the general office, personnel office, inspector's gate, gasoline, oil, water and air service, salvage department, stockroom, and such other signs as will assist persons in finding the places desired.

Gasoline, Oil, Grease, Water and Air Service

193. The gasoline, oil, grease, water and air service should be located in such place as will be most readily accessible to all parties concerned. Competent personnel will be placed in charge of these services and must maintain an ample supply at all times. This service must be accessible at all hours of the day and night. Information will be posted at the gasoline station showing where personnel may be located at any time who can issue these supplies.

194. On account of the fire hazard, all waste oil and grease must be immediately disposed of, either by removal, or by covering same over with sand or dirt.

Receiving, Parking and Quartering of Convoys

195. The following paragraphs of the Manual of the Motor Transport Corps indicate the provision that a park commander must make for the receiving, parking and quartering of convoy:

173 to 178 Camp, Bivouac and Billeting;
216 Park Formations—Motorcycle Company;
227 to 230 Replenishment of Gasoline, Oils, Grease, etc.;
278 Supplies for use while in convoy;
279 Halts for Meals;
292 Unloading Cargoes;
293 Park Formations;
294 Cold Weather Precautions;
295 Same;
297 Changing Cantonment of Company;
332 Heaters to Prevent Freezing in Radiators;
336 Supply of Hot Water for Starting Cold Motors;
599 to 603 Authority of Park Commanders.

196. Parking space, barracks and mess halls intended for the care of convoys should be separate, if practicable, from that used by the park personnel. The latter in many cases must do much

of the caretaking and policing of the reserved area. Signs to tactfully indicate what is expected of transient personnel are valuable.

Reception Park Operation

197. The functions of a reception park comprise:

(a) Receipt of all motor trucks, motor cars, trailers and motorcycles from ships or railroads;

(b) Registering above mentioned vehicles with U. S. serial numbers;

(c) Uncrating and assembling of vehicles which are received knocked down.

(d) Mounting bodies;

(e) Repairing vehicles if received in damaged condition;

(f) Painting vehicles olive drab which are black when received or in rusty condition;

(g) Maintaining an R. F. I. park where all vehicles are parked and kept in good running condition until assigned;

(h) Equipping vehicles upon departure from R. F. I. park;

(i) Salvage of packing bolts, lumber, and material intended as a source of M. T. C. supply.

198. The organization chart for a reception park will conform to the general lines of the Overhaul Park Organization Chart.

199. A suitable site for a reception park should possess the following characteristics:

(a) Park should be as near steamship docks as possible and on a wide road;

(b) Park should be on main railroad line from docks, or branch of same;

(c) Park should be well drained and supplied with sufficient electric power lines;

(d) Water supply should be adequate;

(e) Site should be large enough to construct barracks for personnel of park and transient convoy men, all necessary buildings such as headquarters, supply and stock warehouse, inspectors' building with equipment, assembling facilities, machine shop, gas and oil station, truck, car and motorcycle assembly buildings, forges, battery, service, welding, electrical repair shop, paint shop, carpenter shop, service park immobile, and also the necessary receiving, service, assembling and R. F. I. park areas and roads;

(f) Roads in park, entrances to park, and R. F. I. section should be well rocked and rolled to withstand the heavy traffic, as there will be little or no time for repairs after operations commence;

(g) Site must not be cramped and incapable of handling peak loads. It is better to have too large a park than one too small. Detached plots should be accepted only when this disadvantage is unavoidable.

The following suggestions will be of value:

(a) Insist on a well organized and thorough inspection system;

(b) Park vehicles in an orderly manner according to makes, tonnage and types;

(c) Make provision for overhead chain hoists to remove crates from truck chassis, and for lifting axles, frames, bodies and heavy parts in assembly work;

(d) If railroad track runs through park, assembly building should be erected along railroad, so locomotive crane can unload crates directly into assembly bays;

(e) Maintain the responsibility for individual tool kits;

(f) When necessary to assemble crated vehicles in the open, crate bottoms or skids make an ideal platform for this work;

(g) Main assembly buildings and machine shop should have concrete floor if possible;

(h) All vehicles should be assigned U. S. registration numbers and serial and motor numbers recorded immediately upon receipt;

(i) Stencil these registration numbers, as prescribed in M. T. C. Manual, immediately upon receiving the vehicles and before assembly begins;

(j) Tools and equipment should be checked, removed and stored immediately upon receipt of vehicle in a special section of stockroom in boxes tagged with number of vehicle, and held until same is prepared for departure;

(k) All shortages and damage to vehicles or equipment should be reported to Headquarters M. T. C. immediately, giving all possible information, such as date received, name of ship and truck, serial number, extent of shortage or damage and cause of same;

(l) All traffic in park should be one way. Vehicles should come in one entrance and leave by another. Gas and oil station should be near exit. It facilitates handling if entrance and exit are on opposite sides of inspection building. This can be readily accomplished by establishing a suitable system of one-way roads;

(m) Registration office and park inspector's office must be located at entrance;

(n) Caterpillar tractors, 5 and 10-ton capacity, are indispensable for handling heavy crated vehicles and moving stalled vehicles in bad weather.

200. Reception parks, too frequently must be established at once in available but scattered open spaces without buildings or, at best, with buildings poorly suited to shop work or even storage, without established roads, railroads, ditches, rocked space, or handling facilities of any kind. Necessity for proximity to docks, congestion of port, seizing of handling facilities for other purposes and many other adverse conditions compel action to devise and accomplish expedients which will in some manner, efficiently or otherwise, keep the vehicles moving and the port from being blocked. Under these conditions nothing is impossible and few things are unsuitable.

Movement of a Vehicle Under Service Repair

201. All vehicles needing service repairs will report to the Service Park Inspector. The Inspector will make out work order, M. T. C. Form 112, showing what repairs are necessary. The original of the work order will be sent to the office, the carbon copy being placed in suitable container and attached to the vehicle. Such vehicle will then be sent to the Chassis Repair Department where necessary repairs will be made. When work called for in work order has been completed, the vehicle will be sent to the Inspector for O. K. and delivery to proper party.

Movement of a Vehicle Under Overhaul Repair

202. Vehicles for overhaul repair will be delivered at the Inspector's gate The Diagnostician will make out work order M. T. C. Form 112, showing the repairs to be made, and the departments that are to make such repairs. The vehicle is then sent to the wash rack where it is washed and cleaned and forwarded to the Body Department for removal of the body. The vehicle is then sent to the Chassis Department where the units and assemblies are removed, properly tagged with routing slips, and sent to the department concerned. The units and assemblies are then disassembled, and the parts washed and cleaned. The Final Analysis Inspectors reject such parts as are unserviceable, making requisition on the stockroom on M. T. C. Form 114, for such new parts as are necessary to replace the unserviceable parts. The rejected expendable parts are thrown into salvage boxes from which the salvage gang collect them at regular intervals; non-expendable articles accompany order for material to the stockroom. Work orders are checked to pick up new items which must receive attention. This is accomplished by using a new copy of work order, Form 112, which is given the original work order number and marked with the Final Analysis Department symbol «I.C.» immediately behind the work order number. It is the duty of all department and shop foremen and supply foremen having knowledge of work which should be done, to report the facts to the Final Analysis Inspectors and secure a supplementary work order to cover.

203. When repairs have been completed on the unit or assembly, by the department concerned, the unit or assembly is returned to the Rebuild Department where it is replaced in the chassis. When all such units and assemblies have been replaced in the chassis, the complete chassis is turned over to the Road Test and Final Inspection Department for road test. It is then sent to the Body Department where the body is replaced, and the complete vehicle is then sent to the paint shop for painting and lettering. The vehicle then goes to the Road Test and Final Inspection Department for final O. K., after which it is placed in the R. F. I. park and the proper person notified to call and receive the same.

Movement of Accessories Under Repair

204. All accessories for repair will be delivered at the Inspector's gate. The Diagnostician will make out work order Form 112 covering same, detaching the vehicle receipt from the form and delivering same to the party desiring to have the accessories repaired. Original of work order will be sent to Superintendent's office and duplicate securely attached to the accessory. The accessory is then sent direct to the department that is to make the repairs. After such repairs have been completed, the accessory will be returned to the Final Inspection Department for O. K. After receiving the final O. K., the proper person or organization will be notified that same is ready for delivery. The accessory will be held in the Final Inspection Department until called for. In the event that some of the accessories on a vehicle which comes in for repair are also in need of repair, a new Work Order, Form 112, will be made out to cover each of such accessories which are in need of repair. *The same work order number that is assigned to the vehicle from which the accessories are taken will, however, be shown on these supplementary work orders.*

Movement of a Vehicle Under Salvage Repair

205. When the overhaul cost will exceed 30% of the first cost of the delivered vehicle, it should be sent to a reconstruction park for salvage repair. Salvage repair is defined by the pure salvage line on the chart of M. T. C. Repair Methods.

206. When the vehicle is delivered to the Inspection Gate, it is first washed and the Diagnostician determines whether the vehicle will be reconstructed or disassembled. If the vehicle is to be reconstructed a work order is issued on Form 112. It is then sent to the Chassis Repair Department where the units and assemblies are removed from the chassis and sent to the parts cleaning gang. Such assemblies as are reparable are sent to the departments that are to make such repairs, accompanied by the proper routing slip.

207. The vehicle is reconstructed by assembling units and parts, either by drawing same from the shop stockroom, or by using reclaimed units, assemblies and parts, or manufacturing such parts, as are not available. After necessary units and assemblies have been secured by these methods they are sent to the Rebuild Department where the chassis is reassembled. The reassembled chassis is then sent to the Road Test and Final Inspection Department for road test. After being O. K.'d by the Road Test and Final Inspection Department the chassis is sent to the body shop where body is placed on same, and the complete vehicle is then sent to the Paint Shop for painting and lettering.

208. After vehicle has been painted and lettered, it is sent to the Final Test Department for final O. K. When final O. K. is given, Form 112 is removed from the vehicle and sent to the Superintendent's office, and the vehicle sent to the R. F. I. park.

209. All vehicles rebuilt will, upon completion, be reported to the office of the D. M. T. C. as ready for issue and will be reissued from that office.

Disassembling of a Vehicle for Salvage

210. When it has been determined by the Diagnostician that a vehicle will not be reconstructed, it will be sent to the Dismantling Department, where all units will be removed intact.

211. The units and assemblies will be sent to the wash rack and properly cleaned, after which they will be sent to the Salvage Examination Department, where the salvage inspectors will determine whether or not they are to be repaired, or disassembled for parts.

212. The matter of determining whether or not such units and assemblies will be repaired or disassembled will be governed by the following:

(a) Demand for parts that can be obtained by disassembling such units.

(b) Lack of necessary parts with which to repair such units.

(c) Cost involved in putting such units in serviceable condition.

213. If it is determined that such units are to be disassembled, they are sent to the Disassembling Department, where they are disassembled, the parts properly washed and cleaned and sent to the Salvage Examination Department. The Salvage Inspectors then classify the parts into four classes, as outlined above under heading «Disposition of Salvaged Parts.»

214. If it is determined that the units will be repaired, such units will follow the same procedure as outlined under heading «Movement of Accessories Under Repair.»

Receipt of Salvage Parts

215. When units, assemblies and parts are turned in for salvage, they will be accompanied by M. T. C. Form 168 made out in duplicate covering the articles turned in to the Salvage Department. The original will be signed by the Salvage Inspector and returned to the person or organization turning in such salvage, and the duplicate retained by the Salvage Department for its record.

216. All articles, units, assemblies, and parts turned in for salvage will be tagged with M. T. C. Form 119, showing thereon the manner in which the same is defective. Where there are many of the same kind of parts they may be placed in suitable container and only one tag, Form 119, accompany same.

Disposition of Salvage Parts

217. All salvage, other than salvage vehicles, should be first sent to the sorting platform where the salvage is divided into two classes:

(a) Salvaged units and assemblies;
(b) Salvage parts.

Class (a) is divided into two classes:

1. Those units and assemblies which can be repaired easily by the use of parts from salvage stockroom, or by drawing new parts from main stockroom, «UB»;
2. Those units and assemblies which require too extensive repairs to be practicable, and should be disassembled, and the parts placed in class (b).

Class (b) is divided into four classes, as follows:

Number	*Class*	*Color of Paint Mark*
1	Those parts which are usable at once, and require only to be cleaned and returned to stock......	White
2	Those parts which can be made serviceable by slight repairs	Blue
3	Those parts which can be made serviceable by major repairs	Red
4	Such parts as are not worth the cost of repair, and are considered as junk. This class of salvage should be shipped to the main salvage depot	Yellow

218. A small salvage stockroom, as temporary shelter, may be established in which certain reclaimed units such as motors, rear axle assemblies and transmissions await early use; also those spare parts deemed advisable to keep on hand, such as valves, grease cups, and other parts common for which the current demands are frequent. Salvage reclaiming plants, except at reconstruction parks, will be kept to small size. Activity must be large and the plant small. Surplus stock must be turned in to the shop stockroom, and be picked up on Form 101 by the Supply Officer.

219. All salvage that accumulates in the various departments of the shop will be collected at regular intervals by the salvage department. Suitable receptacles should be provided by each department in which to store salvage awaiting collection by the salvage department. Only expendable salvage should be found in these containers. Non-expendable parts are exchanged as prescribed in paragraph on «Spare Parts Service in a Shop.»

220. Reclaimed parts may be drawn from the salvage stockroom in two ways:

(a) By exchange of duplicate parts; the department drawing the part to turn in old part in exchange.

(b) By turning reclaimed parts over to the Supply Officer, the Supply Officer picking up same on Form 101, and placing the reclaimed parts in stock.

Plant Construction and Improvement

221. No plant construction or improvement will be undertaken except upon work order issued on Form 112, approved by the Commanding Officer. In all cases where the construction and improvements contemplated involve an expenditure of more than $100.00 the approval of authority higher than the Commanding Officer must first be obtained. The work order number on this class of work will always be followed by the symbol «C» to aid in establishing the fact that the work order covers plant construction or improvement.

Plant Maintenance

222. All work necessary for plant maintenance will be covered by work order, Form 112. Work orders must be approved by the Commanding Officer or Superintendent before the work contemplated is undertaken. The work order number covering this class of work will be followed by the symbol «M.»

Manufacturing of Parts, Tools, Etc.

223. No manufacturing of any character will be undertaken except when covered by work order, M. T. C. Form 112, approved by competent authority. The following table shows the authority necessary for manufacturing:

Nature of Work	*Authority Required*
Parts for use in current repair of vehicles in shop	Superintendent
Parts for stock..........................	D. M. T. C.
Tools, shop equipment, fixtures, facilities, improvements and additions, when improvements and additions do not exceed $100	Commanding Officer

224. Manufacture of parts will be governed by conclusions (d) and (e) drawn from the chart on «Repair Methods of the M. T. C.» Weekly reports of articles manufactured on the authority of the superintendent will accompany Form 144.

225. Parts for stock will be manufactured in quantities on orders prepared in the office of the D. M. T. C.

226. Tools, etc., will be manufactured under the above authority after it has been shown that these articles are unobtainable by requisition. Evidence that this has been done will be filed with the work order. Weekly reports of manufacture under this authority will accompany Form 144.

Distinction Between Manufacture and Repair

227. In order that no small amount of confusion over what constitutes manufacture and what constitutes repair may be eliminated, it is necessary to define those terms.

228. *Manufacture in M. T. C. Parks* **means the fabrication of raw or partially manufactured material into a completed useful article or part intended for a certain purpose.**

229. *Repair* means starting with a completely manufactured article which has become more or less unserviceable through use and improving its serviceability and value by any mechanical, hand or machine operation or operations.

230. Manufactured articles are frequently used in repair. Repaired articles can seldom be used in manufacture without conversion from the original purpose.

Maintenance Jobs

231. All maintenance jobs, such as *alterations or repairs* to machinery, *repairs* to tools, shop equipment, and fixtures, etc., must be covered by work orders.

232. These work orders will be issued at the discretion of the Shop Superintendent, on informal memorandum submitted by the foreman of the department concerned, and approved by the General Foreman having jurisdiction.

233. The Superintendent will call for an estimate of cost from the foreman who is to do the work, whenever in the Superintendent's opinion the cost of such maintenance jobs is apt to be excessive. This estimate will be checked against actual cost and filed with the work order.

234. Weekly reports of work done under this authority will be submitted, together with the work order, to the Commanding Officer for his information. Reports on this class of work will be forwarded to the D. M. T. C. only when called for.

CHAPTER X

ADMINISTRATIVE METHODS

Shop Forms, Records and Reports

235. A synopsis of M. T. C. forms, showing their purpose and the manner in which they should be used, is shown on pages 119 to 122, inclusive, Manual of Motor Transport Corps, October, 1918. A table showing what forms are used by Service, Overhaul, Reception and Reconstruction parks is shown on page 123 of said Manual. The matter of M. T. C. Forms is also covered in M. T. C. Bulletin 41.

236. Time slips M. T. C. Form 113, will be turned in by officers in charge of departments covering the total number of hours expended by each man in his department. These time slips will show date, department, work order number, name of workman, rank, and total number of hours per job. Only one time slip will be used for one work order number, and the name of one man only will be placed on the time slip.

237. Absence of men from a department will be noted on the regular form 113, signed by the officer in charge, stating number of hours absent, cause of absence, if known, etc. This applies to any part of the working day, as the records must show the required number of hours of labor per day for each workman, or an explanation of any shortage of this number of hours.

238. All time slips covering the same work order number will be filed with the work order Form 112, when the job is completed.

239. Where labor is expended on work which is not covered by a work order number the following wording will be used in lieu of such work order number, being written in the blank provided for work order number on Form 113:

(a) «Shop Work,» to be used in all departments in accounting for labor expended in sharpening tools, cleaning machines, etc.;

(b) «Inspection and Foreman,» to be used by all foremen, and all workmen in Inspection Department except clerks;

(c) «Military,» to be used to denote time on sick call, time spent in hospital, in confinement, A. W. O. L., or any time lost from shop duty on military matters;

(d) «Supply,» to be used by all workmen assigned to departments «UB,» «UC» and «UF»;

(e) «Administration,» to be used in lieu of work order number by all clerks assigned to park administration and also by shop department clerks;

(f) «Labor,» to be used by all men assigned to yard gangs;

(g) «Salvage,» to be used by all men assigned to Salvage Department who are not working on a job having a work order number;

(h) «Transportation,» to be used by all truck, light car and motorcycle drivers;

(i) «Reserve Park,» to be used by workmen in Department «UE.»

240. The information contained in Forms 112, 113, and 114 will be used for compiling weekly repair park report on M. T. C. Forms 144 and 144-A, these reports being rendered Saturday of each week. The original is forwarded direct to the D. M. T. C., one copy to the M. T. O. of section, and one copy retained for park files.

241. The work of keeping records, and compiling and making reports, will be taken care of by the Adjutant. Suitable personnel will be assigned for this duty from the men in the general office.

Movement of a Work Order

242. All jobs are brought to the Diagnostician, «IB,» at the entrance gate. He makes out work order, Form 112, showing the nature of work to be done, and the departments which are to do the work. The original of Form 112 is sent to the office of the Superintendent; the duplicate is placed in the container and fastened to the steering wheel or other convenient place, and remains with the vehicle or article until it is returned to the Inspection Division and receives the final O. K. by the Road Test and Final Inspection Department, «IF.»

243. When the original of Form 112 is received in the office of the Superintendent, the work order clerk makes out sufficient copies of same to furnish one copy to the Final Analysis inspector and the foreman of each department that is to work on the vehicle, showing just what work is to be accomplished on the vehicle, or article by each department.

244. The Final Analysis Department, «IC,» picks up omissions and corrections found to be necessary in work orders, Form 112, as made out by Diagnostician, «IB,» as a result of the better opportunity afforded at the final analysis stage with parts disassembled and cleaned. All revisions of a work order, Form 112, for whatever purpose are made by this department. See Departments of the Inspection Division and «Spare Parts Service in a Shop,» for further details.

245. When a department has completed the work to be performed on the unit, assembly, or part of the vehicle covered by a given work order, the copy of Form 112 covering same is marked completed, showing date of completion, and forwarded to the office of the Superintendent. When all copies have been returned to the Superintendent's office together with the duplicate from the Inspector showing that the vehicle has been O. K.'d by the Final Inspection, all copies of Form 112 are turned over to the Statistical Department where they are placed with the orders for material, Form 114, and time tickets, Form 113. These papers constitute a complete history of the work done on each vehicle or article.

246. When it is necessary to reject work it is turned back through the original channels beginning with the Diagnostician, «IB,» on a work order, Form 112, bearing the original work order number followed by the letter «A.» The Chief Inspector and the Superintendent will immediately fix responsibility for all «A» work orders. The general results of their investigations will be reported to the Commanding Officer.

Spare Parts Service in a Shop

247. Spare parts service can be most easily traced by following the movement of an «Order for Material, Form 114.» Form 114 is made out in two separate places by separate clerks from Schedule

and Routing Department, «OB.« The first one is stationed with the Diagnostician, «IB,» and the second one with the Final Analysis, «IC.» In future printings of this form it is intended to use a light color of paper for the first clerk, and a darker color for the second.

248. The purpose of having a set of Form 114 made out upon diagnosis is to save the time between diagnosis and final analysis operations for the procurement of parts and supplies not on hand. This time period saved amounts frequently to a matter of days and weeks when the overhaul parking space reservoir (described under Relations Between Production and Inspection Divisions), is crowded.

249. As explained under «Departments of Inspection Division,» the final analysis operation comes in, as its name indicates, as the last word concerning what is necessary to complete the job. It therefore has authority to revise, cancel, or add to the first set of orders for material. The only exception to the finality of the second set of «Orders for Material, Form 114» should be the case of replacement of parts broken, damaged, or lost in later processes of repair. This exception calls in itself for an investigation by the foreman and inspectors concerned as to responsibility therefor.

250. The first set of Form 114 is made out in triplicate by the schedule and routing clerk stationed at «IB» from the work order prepared by the Diagnostician, «IB.» The Diagnostician initials all copies as a check upon their correctness, under the signature of the clerk. The third copy is forwarded to and is finally turned in by Final Inspection, «IF,» with steering wheel copy of Form 112.

251. The original and second copy go at once to the Motor Transport Stockroom, «UB,» where the proper stock is set aside waiting the second set from the schedule and routing clerk stationed at Final Analysis, «IC.» All available parts mentioned on either first or second set of Form 114 are checked with blue pencil on the original and carbon copies of that set. Parts which are not available are checked in red pencil. The carbon copy is sent without delay to Final Analysis, «IC,» for his information. The original is forwarded to the procurement branch first and then to the property clerk for appropriate action. The property clerk then forwards the original to the Statistical Branch where it is placed with all copies of Forms 112 and 113, which bear the same work order number.

252. The «Orders for Material, Form 114» are made out separately for material to go to separate delivery points. They are delivered to the Motor Transport Stockroom, «UB,» and to Final Analysis, «IC,» in complete sets.

253. The second set of Form 114 is made in duplicate upon completion of the final analysis operation. The Final Analysis Inspector, «IC,» initials under the clerk's signature, as evidence that he has checked the new set against duplications or omissions, as compared with the first set and the work order as corrected, and for the presence of all nonexpendable parts or for proper explanation of shortages. Final Analysis, «IC,» is guided in rejections and in what disabled parts will be repaired, by the showing on the copy of Form 114 which came from diagnosis, «IB,» through Motor Transport Stockroom, «UB,» as to what has been set aside and what is not available.

254. The original copy (separate copies of Form 114 for separate delivery points) goes to the Motor Transport Stockroom, «UB,» accompanied by all nonexpendable parts for exchange.

The second copy accompanies the first to be marked as described above for parts available and parts not available, whereupon the second copy is immediately returned, to be retained and turned in through Repair Checking Department «IB,« with the copy of the work order in the hands of Final Analysis, «IC.»

255. Nonexpendable parts are marked «X» in M. T. C. parts catalogues. They will be similarly marked on Form 114 and will be checked in and initialed by Motor Transport Stockroom, «UB,» to cover receipt of parts which cannot be immediately replaced.

256. The second set of orders for material, Form 114, when received from Final Analysis, «IC,» act as a release for stock called for on both sets, as corrected by the second set. The stock then flows to the shop points indicated on Form 114 in old boxes selected for their uniform size to facilitate racking in the stockroom and at the shop receiving points.

Single Parts of Assemblies

257. When parts of an assembly are required on a work order and such parts are not in stock separately, the part will be removed from the assembly and issued, but the whole assembly will not be issued with the part.

258. Requisitions must not call for assemblies when only parts are needed.

259. Parts not in stock separately will ordinarily be removed from assemblies by stockroom employees. In special cases shop mechanics may be used for disassembling, by arrangement between Stockroom Officer and the proper foremen.

260. Undrawn parts of assemblies will be retained in stock. They will not be turned in to the Salvage Department.

261. The Stockroom Officer may, at his discretion, replace parts taken from an assembly or separate the assembly into its component parts and replace them in stock as parts. Appropriate change in stock records must be made.

Parts Common Service in a Shop

262. Straight prohibition against the desire of shop men, power plant men, and others to have nuts, bolts, nails, cotter pins, emery cloth, rivets, gaskets, washers, shim stock, wire, porcelain cleats and knobs, screws, etc., handy is of no avail to the Commanding Officer and the Supply Officer. If the Superintendent and foremen learn by dint of hard experience, the wastefulness of having workmen's pockets and bench pockets in which the scant supply of these things can slip, if a real shop «round-up» has once shown them what it can yield in the way of things of which «we are all out,» both sides are ready for a constructive solution.

263. Pooling of transportation, like combination of small mutually destructive business interests, has demonstrated its superiority over everyone having his own transportation. Pooling of spare parts is accepted. Pooling of parts common must be.

264. The Motor Transport Stockroom, «UB,» must dispatch parts common by the regularly assigned stock runners from shop personnel. Stockroom «UB» must be equipped with a number of carrying trays divided in a manner similar to a carpenter's combination nail and tool tray, with centerboard handle hole.

265. These trays must vary slightly in design for the service of different shops. When the supplies going regularly to certain shops are light and bulky, the trays may be double decked. Trays

must be plentiful enough in number so that a filled tray is always waiting near the shop issue window to replace a returned empty one.

266. A shop is charged with the contents of a full tray when the tray leaves and is credited with the amount returned. The amount consumed is the difference which the department clerk must distribute over his current work orders in such a manner that the quantities charged do not greatly exceed the quantity which the job can use. The stock runner goes among the shop workmen at regular intervals with his trays, permitting them to take reasonable amounts and reporting hoarding. This plan is not one whit better than no plan at all insofar as relieving an indifferent foreman from the necessity of constantly watching certain workmen to prevent hoarding and wastefulness. It will reduce this tendency when the automatic supply becomes regular and dependable, for most workmen will appreciate that their excuse for hoarding is gone. The difference between a shop with such a plan in successful operation and one without it, is the difference between a shop with method and discipline and one without it.

Tool Service in a Shop

267. For composition of and regulations governing Individual Tool Kits, see that paragraph heading.

268. Special tools, forming part of the shop equipment, are issued for temporary use on numbered metal checks issued to the soldier for that purpose. Periodical return of tools out upon checks is desirable.

269. A systematic tool service is necessary by which suitably trained men passing through the shops with replacement tools exchange serviceable tool kit rolls, screw-drivers, chisels, oil cans, wrenches, hammers, hatchets, drills, bits, hack saw blades, files, pliers, lathe tools, milling cutters, etc., for disabled and broken articles, or replace lost tools for signed receipts. These receipts are turned over to the Equipment Department, «UF.» When he observes disabled articles which he cannot replace upon the spot, he provides himself with the proper tool in order to make the exchange upon the next trip. Disabled tools are sent by the Motor Transport Stockroom, «UB,» to the toolroom for redressing and repair. This provides the current of unserviceable tools on which the segregated and inaccessible toolroom mechanic may work.

Regulations for Shop Transportation

270. The responsibility for upkeep and proper maintenance of all transportation of the shop rests with the Supply Officer. No car, motorcycle or truck will therefore be used for any purpose whatsoever without permission first being obtained from the Supply Officer.

271. The Supply Officer will detail transportation to the different departments in line with their requirements, and such transportation will be used only during working hours. Heads of departments are required to see that transportation furnished their respective departments is returned to proper location in the shop. Unless proper permission is obtained from the Supply Officer, transportation vehicles will not be used after shop hours.

272. Transportation in the shop for repairs and fit for use, may, subject to the prohibitions below, be used by the Production Superintendent and the Inspection Division under the following conditions:

(a) To tow other vehicles on work incident to repair and inspection;

(b) To tow disabled transportation to the shop;

(c) To convoy supplies from one point to another.

273. The use of transportation under this provision should be, whenever practicable, confined to transportation awaiting repair which will not suffer thereby rather than transportation which has been made R. F. I. Use of transportation under this authority must be limited to necessity. Its use places the Commanding Officer on the defensive. He must protect himself by reference to his action thereunder in weekly reports. Use of R. F. I. transportation will be covered in his daily telegrams on R. F. I. vehicles. Use of R. F. I. transportation or transportation in for repair for other than park purposes must be ordered by higher authority by indorsement on the recommendation, favorable or unfavorable, of the park commander.

274. Proper steps have been taken to have a definite allowance of transportation prescribed for repair sections groups and units when operating in parks of various size. These allowances will be announced in due course.

275. The following practices are prohibited:

(a) Using transportation not belonging to the shop, but in the shop for repair or experimental purposes, without the knowledge and consent of the Inspection Division.

(b) Using transportation for experimental or shop purposes which is about to leave the shop for return to the organization to which it pertains, without the knowledge and consent of the organization commander, when the length of the experiment would delay delivery, or extend over the time of delivery.

(c) The use of transportation not pertaining to the shop for conveyance of shop personnel to and from their quarters, except by special permission of the Commanding Officer, or of the organization commander to which the transportation belongs.

(d) The use of any transportation when in a condition which would make its use inadvisable from the standpoint of additional cost of maintenance.

Prohibited Practices

276. The practice of lowering automobile tops has been found to result in expensive maintenance cost. Top boots will not be issued to Government automobiles except on special authority. When cars come into the shop for repair, any top boots found in the equipment will be removed.

277. In order to secure uniformity of color for Government olive drab or green vehicles, a uniform treatment will be given in all cases. Special varnish will not be applied except when authorized by superior authority.

278. When vehicles require trimming, especially new tops, they will be held in the shop until completed. The practice of releasing cars for use while tops are being made will not be permitted.

279. Employers are prohibited from soiling the upholstery of touring cars. Suitable covers will be provided by the Superintendent to protect the upholstery, and the Inspector will see that these covers are used. General foremen and assistant foremen and the Inspectors will see that this rule is enforced. Failure to

comply with it may result in court-martial for carelessness in damaging Government property. (A. W. 83.)

280. No change, alteration, improvement, extension or modification of any building will be made without definite approval by the Commanding Officer and, when necessary, by higher authority.

281. Release from the shop, except through the Supply Department, «U,» of any repaired article of whatever nature received into the shop by the Supply Officer, or of any manufactured article, is prohibited.

282. Patrons, except commissioned officers, will not be permitted to visit any shop or shop area except upon a special pass. The guards are required to enforce this order and to direct patrons to the office. Commissioned officers will not be restricted except at the discretion of the Commanding Officer in inspection of the shop, but the guards will request officers who desire to inspect the shop to report the fact to the Adjutant, in order that suitable provision may be made for the visitor.

283. The use of gasoline for cleaning purposes will not be permitted. Articles to be cleaned will be taken to the cleaning vat or washing platforms and racks.

284. The use of Government material, hand tools and machinery for making of souvenirs is prohibited.

285. The term «shop order» will not be used as it has a tendency to confuse administrative orders with work orders. The term «work order» will be used to cover all orders for repairs to be made, or other work to be done in the shop. The term «park orders» will be used for orders governing administrative matters of repair parks.

286. The term «A. L. A. M.» (Associated Licensed Automobile Manufacturers) being an obsolete term, will not be used. The term «S. A. E.» (Society of Automotive Engineers) will be used instead.

Fire Orders

287. See Par. 188 to 194, Manual of the Motor Transport Corps. The provisions of Par. 193, relative to having fire extinguishers clearly designated, will be accomplished by following the instructions and sketch shown below. This sketch illustrates the method of marking fire extinguisher locations and has for its purpose:

(a) Reduction of the number of extinguishers required to give protection.

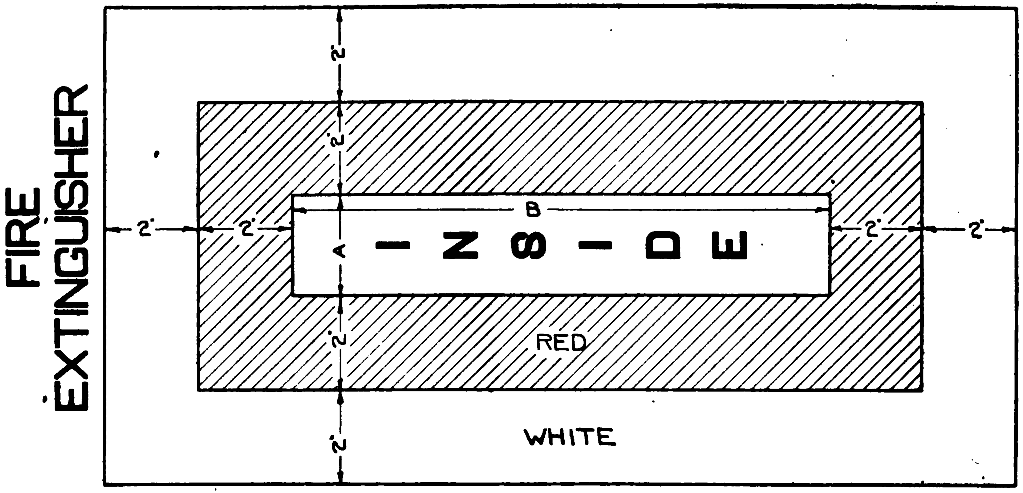
(b) Making inside extinguisher instantly available to sentinels and watchmen.

(c) Elimination of part of confusion after discovery of fire before fire equipment can be located.

(d) Impressing fire equipment locations on plant personnel.

288. The above aims are accomplished in the manner indicated by the notes on the sketch. Where fire extinguishers are exposed they suffer from exposure to weather, from theft, and from mislocation, and damage from passing vehicles. When fire extinguishers are placed near doorways, they are not as available for the use of watchmen and sentinels as when placed close enough to windows so that by breaking windows anyone can reach in and secure the extinguisher.

289. It is desired that special attention be given to this matter of suitable location of fire extinguishers in sufficient quantity to reduce as far as practicable the fire hazard in M. T. C. parks and stations.



PAINT WITHOUT ANY LETTERING. AROUND ALL EXPOSED FIRE EXTINGUISHERS: PAINT ON OUTSIDE OR OPPOSITE OF ALL PARTITIONS OVER SPACE OCCUPIED BY FIRE EXTINGUISHERS ON INSIDE OR OPPOSITE SIDE OF WALL USING WORDS "FIRE EXTINGUISHER" AND APPROPRIATE WORD "INSIDE" OR "OUTSIDE" AS INDICATED.

A= OVERALL WIDTH OF EXTINGUISHER. B= OVERALL LENGTH OF EXTINGUISHER. LOCATE INSIDE EXTINGUISHERS NEAR WINDOWS INSTEAD OF DOORS TO FACILITATE BREAKING IN TO REACH THEM IN EMERGENCY.

Precautions Against Fire

See Par. 195 to 199, Manual of the Motor Transport Corps.

Fire Drills

290. Some set manner of procedure should be determined upon for each individual in the event of fire. To this end it is advisable that the duties of each individual be known to him in order that there may be no hesitancy when the alarm is sounded. Fire companies should be formed for the purpose of manning chemical engines, hose carts and all other available fire apparatus, and will be definitely instructed as to the location of this fire apparatus. Some system of fire alarm should be provided by shop whistle, if possible, and a schedule arranged so that the fire companies may be made acquainted with the location of the fire by the number of blasts of the whistle. When an alarm is sounded, the fire companies should immediately man the chemical engines, hose carts or available apparatus and rush to the fire. The remaining personnel will fall in at definitely assigned stations. Confusion will be avoided and parties of any size made readily available for an emergency duty by their being required to remain at their respective stations until recall is sounded.

291. In case a fire of large proportions seems imminent, all available tow trucks should be assigned to the duty of clearing the yards of all trucks and vehicles. Men who will drive these tow trucks, if the necessity arises, will be chosen and their duties explained to them.

292. The senior officer present will act as Fire Marshal. The Officer of the Day will supervise the gates and the evacuation of the yard. The Supply Officer will supervise the removal of supplies. Because of the economic loss from mixing supplies and retarding regular issues, bin stocks of supplies will not be moved until it becomes clearly necessary to do so. Fire salvage squads may be practiced in the movement of box and crated stock at fire drills until confusion disappears.

293. Fire drills may be initiated by the following plan: Red bunting displayed on a building within the shop or barrack area will represent the fire. Anyone who discovers the red bunting so displayed will give the alarm by the quickest means possible.

CHAPTER XI

HINTS

Hints for Commanding Officer

294. Successful operation, after good organization has been attained, depends upon:

(a) Grasp, perspective, and example on the part of the Commanding Officer;

(b) Avoiding emphasizing special features out of their real importance by favored attention to some at the expense of other functions;

(c) Clear conception and careful adherence to the main objectives and purposes of the park;

(d) Encouragement of initiative by giving each officer and man a little more responsibility and work than that to which he is equal;

(e) Definite plan of instruction which will round out all classes of personnel in such a manner as to fit them for individual advancement to higher grades;

(f) Elimination of discontent by vigorous suppression of idle and unintentionally malicious criticisms, and by provision of suitable recreation and welfare facilities.

295. Do you permit your subordinates to keep you stirred up with their petty quarrels that you should insist they settle among themselves or in your presence if necessary?

296. What men are constantly overstepping their authority?

297. What men fail to fully discharge their duties by leaving part of the duty on someone else?

298. Do these men understand why they are hard for their associates to cooperate with?

299. What men are incapable of separating their own official acts from personal feeling? What men constantly put the worst possible interpretation on the acts of others?

300. Are any poorly chosen representatives of the Commanding Officer exercising too much authority?

301. Have you any case where you are holding a man responsible for something when you have withheld the authority which should go with the responsibility?

302. Do you or any of your assistants meddle too much within the province of a subordinate? If so, you must accept complete responsibility for your failure to stay within your own province. No fault can be more serious except absolute neglect of duty.

303. Are your lines of organization so drawn that your subordinates can shift responsibility for errors and neglects from one to another? Have you learned the art of stopping blame shifting by showing them up to themselves in their true light where they were ready to undo anyone else if by so doing they could discover an opportunity to dodge responsibility?

304. If you simply put your finger on these faults, would not they be promptly corrected?

305. Do you overmeasure discipline by punishment, where mere indication of the fault would be better?

306. Do you realize that you are unfair to subordinates when you overlook their minor faults?

307. Are you seeking popular approval, or commanding respect, from your subordinates?

308. Have you acknowledged to yourself that the real reason for your being in an officer's uniform is that you have been judged to be capable of training men, of being part of the machinery of assimulation which takes raw officer and soldier material and makes the finished product?

309. How much of a success do you count yourself in the art of making good material out of fair or poor material?

310. Do you shrink from the task of making an unwilling man a willing one?

311. How much time have you wasted in complaining about human material in your hands which is not worse than that with which others are dealing successfully?

312. Do you withhold recognition and appreciation where it is due?

313. When you have to take a man to task does he deny your charges or acknowledge them? Does he resent the way in which you talk to him or thank you for it? Does he leave you with his head erect in self respect and hopefulness or looking at his feet in a crushed spirit or in sullen anger? Does he say he wants to prove himself to you or does he leave you without hope of retrieving himself? Does he fully realize before the next day just what has happened to him?

Hints for the Adjutant

314. Familiarize yourself with the proper form for military correspondence, special orders, park orders, reports, etc.

315. Keep a card «tickler» or similar device showing the matters to be taken up with the Commanding Officer, heads of divisions, your personnel adjutant, welfare officer, etc., also dates on which reports are due and similar current information.

316. Never permit routine matters of trivial nature to reach the desk of the Commanding Officer. The handling of this class of work is your work. He has more important matters of which to think.

317. Check all papers prepared for the signature of the Commanding Officer. Make sure that they are properly prepared as to heading, body, and signature, and that they have been properly initialed before reaching his desk to be signed.

318. Have all officers report out in the adjutant's office before they leave the shop reservation. Require them to report in, in a similar manner. A handy means of doing this is a roster which shows at all times the officers on duty at the shop, those temporarily absent, those absent on leave or sick, Officer of the Day, etc. This roster may be kept by installing upon the wall a suitably slotted and marked board which will receive small tin containers for holding a name tag. The name tags are taken out and placed under appropriate headings on the board to show the location of the officer.

319. Keep a roster for Officer of the Day, and for such other duties as may be necessary.

320. Use a printed routing slip for routing correspondence and papers to different departments of the shop.

321. Circulate to the heads of the divisions such matters, General Orders, Bulletins, etc., as will be of interest and benefit to them.

322. Keep in close touch with the matters which the Commanding Officer is handling. Follow them up in order to prevent their being delayed.

323. Keep a close check on correspondence to insure its being promptly answered, and prevent its laying around on desks in the different departments.

324. Instruct all clerks and stenographers in the proper method of handling papers and correspondence, the routes same will follow through the office, etc., in order to insure prompt dispatch to the proper parties.

325. Keep close supervision over the files to insure papers and correspondence being properly filed so that same can be easily located when desired. Institute a system whereby papers requiring action on certain dates will be placed on your desk for attention.

326. Instruct your Statistical Clerk in the proper manner of keeping records, rendering the required reports, etc., covering operations of the Park.

327. Have all incoming and outgoing mail pass over your desk, in order to keep a check on matters being handled and prevent papers going to wrong parties, or being forwarded without being in proper form.

328. You are responsible for the military instruction of the Park Personnel. Outline a definite program for military instruction and see that it is carried out.

329. Make an inspection of the mess halls, kitchens and quarters of the men at frequent intervals to insure that they are in the proper condition, and that the men are being properly fed.

330. See that all desks are kept neat and orderly, all papers put away, all typewriters covered, etc., before men leave their desks at closing time. See that stenographers take the proper care of their typewriters and keep them clean and properly oiled.

331. See that the Personnel Officer keeps all service records, qualification cards, locater cards, and other necessary records in the proper manner. Also see that muster and pay rolls are rendered promptly and properly, and that other necessary personnel reports and records are promptly and properly handled.

332. Listen to the complaints that men and officers have to submit, but transfer only such of same to the Commanding Officer as can not be taken care of by yourself or other officers of the organization.

333. Familiarize yourself with the Manual of Courts-Martial with reference to Summary Court proceedings and the handling and forwarding of papers for higher courts-martial.

334. Organize an Officers' Mess and see that same is properly operated.

335. Prepare a list each day of matters to be taken up at Officers' Call, and submit same to Commanding Officer.

336. Copy of paragraphs 599 to 603 inclusive, Manual of the Motor Transport Corps, on the subject of «Authority of Park Commanders» should be kept conspicuously posted in a glass frame, where shop patrons can readily see it.

Hints to the Welfare Officer

337. Upon your efforts and your actions depends to a very large extent the lubrication of the organization=the happiness and contentment of the personnel.

338. Keep close supervision over the mess halls and kitchens in order to insure that food is properly prepared and promptly served.

339. Have a meeting of your mess sergeants once each day to discuss the problems of the mess.

340. Have the mess sergeants submit each morning a menu for the day. Ascertain what the men like to eat and endeavor to gratify their wishes. Do not permit the cooks to fall into a rut and dissatisfy the men by giving them the same thing to eat from day to day.

341. See that the cooks and kitchen police are clean and that the cooking utensils and kitchens are kept clean and orderly; that the stoves are properly cleaned and kept in good condition.

342. Take advantage of every opportunity to secure fresh vegetables and other articles of food not furnished in the regular issue, utilizing the company fund for this purpose. Men will work hard under adverse conditions, with poor clothing and endure other hardships, if they have plenty of good food to eat.

343. Make frequent inspections of the quarters of the men and the company streets to see that they are kept clean and orderly. Encourage the men to beautify their company streets by means of building sidewalks, gravelling the streets, etc.

344. Keep on the lookout for anything that will promote the health, welfare and contentment of the men.

345. Cooperate with the Chaplain in getting up entertainments, boxing, wrestling, baseball, football, and basketball games, track meets, musical entertainments, games, and other kinds of amusement which will develop and promote *esprit de corps* among the men of the organization.

346. Institute a reading room, if you have no Y. M. C. A. Secure some papers, magazines, books, writing paper, phonograph, and other things for the entertainment of the men.

347. Supervise the officers' mess and see that same is kept in proper condition; that the food is properly prepared, and that the kitchen and utensils are kept clean and properly taken care of.

348. See that the company barbers and company tailors perform their duties properly; that they do not charge excessive prices, and that proper accounting is made of funds.

349. See that the company funds are properly expended and accounted for; that same are not used for illegal purposes, and that they are expended for the best advantage of all of the personnel.

Hints for the Supply Officer

350. The supply problem of spare parts and material, consists of the phases of procurement, storage and distribution.

351. In order that parts may be requisitioned intelligently, ascertain the make, type and approximate number of vehicles dependent on your park.

352. In maintaining parts stock use M. T. C. Bulletin No. 59—Repair Park Allowance Lists of Parts, and M. T. C. Bulletin No. 66—Interchangeability of Parts as a basis.

353. Anticipate your requirements of blank forms, stationery, furniture, fixtures and office supplies, in order to keep sufficient quantity on hand.

354. Familiarize yourself with what constitutes soldiers' individual equipment for M. T. C. Personnel, both Quartermaster and Ordnance equipment, and provide necessary supply to properly equip the personnel of your park.

355. Keep a perpetual inventory of parts and material. Do not wait until the supply of any part is entirely depleted and then rush requisitions by telegraph. On the other hand, do not hoard parts.

356. Keep your bins in the stockroom filled with ten days' supply of parts when the spare parts situation permits. Do not permit spare parts to lie in boxes in the warehouse when you have room for same in bins. Do not break open boxes unnecessarily for the constant shortage of parts requires that you be able to do your part in making emergency shipments either from bin stock or unbroken boxes. It takes time to repack.

357. The proper instructions and efficient supervision of the operating personnel will eliminate either shortage or hoarding of parts and insure the distribution of stock to the best advantage.

358. Familiarize yourself with M. T. C. property accounting system and see that necessary reports are rendered and proper forms used covering M. T. C. property in your charge.

359. Copy of paragraphs 599 to 603 inclusive, Manual of the Motor Transport Corps, on the subject of «Authority of Park Commanders» should be kept conspicuously posted in a glass frame, where shop patrons can readily see it.

360. Require a daily report from your stockroom, your receiving room, your shipping room, etc., summarizing the status of their uncompleted work and the time it has remained uncompleted.

361. Secure the cancellation of requisitions and shipping orders of longer standing than a certain period suited to local conditions. In the stress of campaign this period has been reduced at times to one week. It should never be longer than three months.

362. Do not expect card systems to make up for indifference or carelessness on the part of yourself or your assistants or for your failure to find time in which to inspect the work of your department at scattered points in detail at unexpected times.

363. A finder card system for locating stock is fine in theory, but is a nuisance in practice when it is wrong. None of them are perfect. A finder system has been demonstrated as unnecessary for handling 35,000 items by the simple expedient of having an absolutely similar system of placing stock of different makes by classified grouping corresponding roughly to the grouping of parts on the vehicle. This refers particularly to bin stock parts. For a suggestion, see paragraph 172 «Stockroom, Bin Stock and Assemblies.»

Hints for Inspectors—General

364. Whenever possible the individual making the inspection of a car to be repaired should be the same person receiving the car from the responsible officer or his representative.

365. He should be neat in appearance, courteous and diplomatic. He should always hear the story of the responsible officer or his representative before making any suggestions and consider that, unless he has examined the car, the responsible officer or his representative knows more about its condition than he does.

366. The inspector should keep conspicuously posted in a glass frame, where shop patrons can readily see it, a copy of paragraphs 599 to 603 inclusive, Manual of the Motor Transport Corps, on the subject of «Authority of Park Commanders.»

367. After the inspector has gone over each point enumerated below and indicated on the Work Order, Form 112, just what is necessary to put the vehicle in condition, it is frequently advisable to exhibit the same to the party turning in the vehicle, particularly if the responsible officer himself is present. The giving of estimates as to the probable cost of material and labor should be avoided, since this is a function of the Production Superintendent. It must be made clear to any party asking for such information that the park cannot be bound by estimates made prior to the final analysis and except through the proper channels.

368. It is well to point out to the responsible officer or his representative that not only is there no objection to his being represented during the road test and final inspection, but that it is desirable. Acceptance of a vehicle without filing a protest in writing as to its condition relieves the repair park of all responsibility for faults discovered later. Conspicuous signs should be posted to this effect.

369. After the Diagnostician has learned all that the responsible officer or his repesentative can tell him about the condition of the car, he will make a complete diagnosis of the car. The objects of this diagnosis are three-fold:

(a) What repairs are necessary?

(b) Are they due to improper handling? If so, the evidence should be noted as a stop to criticism for the amount of repair undertaken.

(c) Are the repairs due to faulty design or construction?

370. A scheme for marking defects noted as falling under class (b) or (c) should be devised. Flagrant cases of (b) should be reported to the park commander for such action as may be deemed proper.

The diagnosis should cover:

For Motor Trucks

371 The «Points to be Observed,» as shown in paragraphs 369 to 416, Manual of the Motor Transport Corps, plus the following:

Radiator

(e) Is the radiator properly secured?
(f) Is it provided with a proper guard?

Hose Connections

(c) Does the hose itself need replacement?

Valve Adjustment

(b) Is there evidence of burning of some valve seats and none in others? See M. T. C. Bulletin 63.

Carburetor

(d) Is the carburetor free from sediment?
(e) Is the carburetor properly secured?
(f) Is it properly adjusted for operating the vehicle at high and low speed?

Oiling System

(e) Does the device indicating the oil level in the crank case operate properly?
(f) Does the crank case leak?

General

(g) Do any cylinders misfire?
(h) Does the exhaust manifold leak?
(i) Does the muffler need replacement or repair?
(j) Does the hood fit properly?
(k) Do the hood catches need replacement or repair?
(l) Is the motor properly bolted and cottered?

Magneto

(e) Has the condenser been pierced?
(f) Does there appear to be a «short» in any cell or any «dead» coil?
(g) Are the cylinders properly timed?
(h) Is the magneto properly secured?
(i) Is the magneto cover present?

Generator

(d) Is sparking at the commutator excessive?
(e) Is the generator properly secured?

Battery

(f) Does the battery box need repair or replacement?

Instruments

(b) Is the speedometer or odometer working properly?

Lamps

(a) Indicate which lamps do not work properly.
(b) Indicate which headlight glass needs replacement.
(c) Do the lamp brackets, reflectors or housings need repair?
(d) Are the headlamps pitched properly for night driving?

Horn

(a) Is the horn properly secured?
(b) Does it work properly?

Starter

(a) Does the starter work properly?
(b) Does the starter chain work properly?
(c) Is the starter properly secured?

Fuel System

Gasoline Tank

(a) Is the filling cap dustproof?

Transmission System

Clutch

(g) Does the housing need repair?

Gear Box

(e) Are there any signs of the gear box having been forced out of place?

Differential

(g) Does oil leak from axle housing on the brake drums?

Steering Gear

(d) Does the steering gear bind at any point?

Front Axle

Axle

(a) Is the axle reversed?
(b) Is it bent?

Springs

(g) Does any spring show unusual sag loaded? Unloaded?
(h) Is there any marked difference in the sagging of springs?
(i) Are shock absorbers working properly?
(j) Are rebound straps in good condition and properly adjusted?

Tires and Wheels

Tires

(f) Do solid tires need trimming?

Wheels

(5) Are the flange bolts tight?

Chassis

Body

(i) Is any lettering or stencilling necessary?

General

(a) Are all grease cups and oil cups present?
(b) Locate squeaks and rattles affecting mechanical operations.
(c) Locate unusual «knocks» and «roars» in mechanism and fix upon repairs necessary to cover them.

For Motor Cars and Light Delivery Trucks

372. Follow the «Points to be Observed» for motor trucks insofar as applicable, also the following:

Seat and Dash

(e) Does the windshield operate properly?
(f) Is the glass cracked, chipped or loose in the frame?

Top

(c) Is the top in good condition?
(d) Do the rain curtains fit?
(e) Is the top properly secured to the windshield?
(f) Are back curtains and top supports in good condition?

Body

(a) Is the body properly fastened to the chassis?
(b) Does it need repair?
(c) Is the upholstery soiled, torn or worn?
(d) Does the body need repainting or finishing?
(e) Is any lettering or stencilling necessary?
(f) Does tool box need repair?
(g) Do running boards need repair?
(h) Do all doors and windows fit and operate properly?
(i) Do any floor mats need replacement?
(j) Are there any bad body squeaks to eliminate?
(k) Does spare casing holder need repair?

For Motorcycles

373. Follow the technical Inspection for Motorcycles, Par. 424, Manual of the Motor Transport Corps.

Hints for the Superintendent

374. The example of the Superintendent is the inspiration of his shop.

Is he a critic of his superiors?

Does he grumble before he obeys an order?

Does he take his assistants to task before their subordinates?

Does he judge his subordinates upon reports before they have been heard in their own defense?

Does any subordinate have reason to feel that he is under suspicion, that his work is unsatisfactory but that he could readily make it satisfactory if his attitude or his acts could be explained?

Does the Superintendent allow a subordinate to drift when guidance and securing the man's confidence would solve the problem?

Are changes in the Superintendent's spirits, as affected by his health, personal affairs, ambitions, or fidelity to his work, showing in the morale of the shop?

Have his subordinates learned from his example to loyally carry out the line of action resulting from a decision by superior authority when this decision is known to be contrary to the Superintendent's views?

Is the Superintendent a source of inspiration to tired, cold, hungry men when the exigencies of the service are trying to everyone?

Is the Superintendent a soldier as well as an officer?

375. Hold daily conferences with the department and shop foremen, lay the entire shop operation plans before them, and insist upon each shop dovetailing with the others in such a way that you have a smooth running machine.

376. Check the department foremen's work daily, making notes regarding order, cleanliness, proper handling of tools, vehicles, units or parts, which are moving slowly.

377. Keep a sharp eye for the conversion of material, do not permit the manufacture of articles which are unauthorized.

378. Check the departments and shops for the hoarding of parts and supplies which belong in the Supply Department.

379. The Superintendent's place is in his shops, not in his office. He is provided with qualified office assistants in order that he may be out of his office most of the time. Production is obtained in the shop, not in the office.

380. Copy of paragraph 599 to 603 inclusive, Manual of the Motor Transport Corps, on the subject of «Authority of Park Commanders» should be kept conspicuously posted in a glass frame, where shop patrons can readily see it.

Hints for Department and Shop Foremen

381. Are you, as a department or shop foreman, among your subordinates what you think the Superintendent ought to be among his subordinates? See hints for the Shop Superintendent.

382. Keep all members of your shop informed on all subjects concerning shop operation, to coordinate with the other shops.

383. Keep all vehicles, units and parts requiring repair, moving. If part of your shop is held up due to a repair which must be accomplished by another department, get in touch with the department foreman.

384. Organize your shop into repair groups. Keep the same gang on the same class of work. The men will soon learn short cuts when on one class of work. Quantity production flows from short cuts.

385. Keep your shop orderly and clean. Have your men adequate tools? Have they a place in which to keep them? Are they

maintained in workable condition by proper caretaking by the workmen themselves and by systematic replacements of properly sharpened and dressed tools prepared by selected toolmakers and blacksmiths?

386. Are your shop operations arranged in a progressive manner? Why do some things stop and hang along the route they should go?

387. When articles which have been repaired by your department are returned by the inspection department, don't waste time fighting the inspector, but fix the responsibility on the man or men on whom it should fall. If you have permitted a system of dual responsibility the blame is yours. Have you been caught twice in the same way? You cannot afford to see the third time.

388. Is the machinery, transmission, etc., within your department properly lubricated, and in the best condition for operation?

389. Are you thinking too much about technical and mechanical things and too little about men?

390. Do they say behind your back that you are square even if you are particular?

391. A man who understands men can be a success when other men know more about the work and less about men than he does but he cannot afford to let them have even this advantage over him. Study is the answer.

392. When working with inexperienced personnel, gain their interest and hold their attention by simple language, illustrations, homely comparisons and a little occasional humor of high quality. Principles of construction and operation are then easily absorbed.

393. Do not take assertions by a new man as a criterion of his ability as an experienced mechanic. It is only by being in constant touch with your men that you are able to learn their real ability.

394. Do not attempt to make a man feel incompetent by ignoring suggestions he desires to offer.

395. When your ideas are not accepted higher up, think it over to discover why the broader vision of the man higher up sees something not quite practicable or feasible enough. You may have overlooked some very important factors bearing upon the subject. Really good ideas cannot be denied. Delaying them compels more study and not infrequently makes them of much greater value.

396. Know men. Each one is of a little different model and type. Learn to use them according to their capacity and in the way they were intended to be used.

397. Attention to detail wins. Attention to the wrong detail means defeat. Attend to all of the details but do not play favorites.

398. The foremen must abide strictly by the rules laid down by the Superintendent and are held responsible for:

(a) Seeing that work is not delayed by slowness in making out, handling and filling orders for material and parts;

(b) Seeing that all tools and machines are correctly used and not abused;

(c) Reporting all men who are absent without permission;

(d) The correct routing of work through his department and that work follows the route without eddies and countercurrents;

(e) Receiving information from the inspectors in his department and using same to good advantage;

(f) Making estimates as to the quantity of material and the length of time necessary to do certain jobs;

(g) Making recommendations for the men in his department, taking into consideration their conduct and ability;

(h) Making recommendations for the transfer of men from his department to another for the betterment of the service;

(i) The keeping of prescribed records of his department;

(j) The rendition of time slips at the time set by the Superintendent.

399. The foreman should always be on the lookout for short-cuts in operation that will increase the production of the organization of his department. Look in your own department first. It is only by coordination on the part of the foremen that the organization can function properly.

400. Do not be afraid to express an opinion on any particular subject when asked to do so.

401. Production does not come out of a desk and a chair, but it always accompanies well-worn shoes.

402. Put your whole heart and soul into your work and stay on the job as though it was your own business and you yourself were paying the men for every hour's work produced.

403. When a foreman takes an active interest in his department and his work, satisfactory results are bound to be obtained. Do not expect to accomplish everything in a day. Go home in good spirits but with the feeling that you could have accomplished just a little more.

404. Make it your business to keep in constant touch with all shop movements, and when shop orders are issued make sure that you are thoroughly familiar with contents of same.

405. Always receive suggestions in good faith. Valuable information may be obtained by being a good listener.

406. Learn as much about the other fellow's job as you can without interfering with your own. Information gathered in this way makes for you a reputation for good teamwork.

407. Do not be of a changeable mind. After you have made up your mind that a job is to be done in a certain way, do it. If you want to change your mind change it the next time. Nothing discourages a man more than to know that the foreman does not know what he wants.

408. Be an advocate of military drill and instruction in your organization. It teaches teamwork, obedience, confidence in others, loyalty, punctuality, tolerance, comradeship, and mutual respect. It frowns on dissension, shirking, unfair treatment of subordinates, and on mere assertion against your fellowman accepted in place of proof. It teaches decision, fair play and adaptability to hardship, long hours, privations and fidelity to duty.

409. Copy of paragraphs 599 to 603 inclusive, Manual of the Motor Transport Corps, on the subject of «Authority of Park Commanders» should be kept conspicuously posted in a glass frame, where shop patrons can readily see it.

CHAPTER XII

EQUIPMENT

Distribution of Equipment by Priority

410. The following is the plan of distribution of complete equipments for Overhaul Parks and Service Parks.

411. Service Park equipments, mobile, will be furnished to armies in accordance with existing plans and in priority to other demands.

412. The authorized equipment of each unit, in accordance with existing tables of organization, is fixed in tables shown below. Requisition will not be submitted except for replacement of items lost or worn out. Replacement issues are simplified by Par. III, G. O. 133, G. H. Q., August 9, 1918, which requires only the affidavits or certificates of loss which usually accompany a survey instead of the survey itself. Affidavits and certificates of loss will be in themselves a requisition when *accompanied by a statement that immediate replacement of articles is desired.* They need not be accompanied by a requisition.

413. Upon the approval of any project in the S. O. S., the same approval will automatically authorize the immediate supply of a suitable equipment. Shipments will proceed automatically after initial shipping order for a given equipment is given.

414. This will be the standard equipment for a project of a given type, less available equipment. Equipment on hand will be reported as required in Chapter VIII, «Data Required for Starting M. T. C. Repair Projects.» A priority number will be at once assigned which will fix the order of precedence in supplying initial equipments, whether in stock or in the process of accumulation.

415. All correspondence and accounting pertaining to equipments will specifically refer to the priority number assigned to project and all items of equipment or packages upon assignment to equipments, will be indelibly marked as a means of identification in transit and in use. Upon receipt of equipments the marking will be applied to contents of packages not previously opened for that purpose.

Equipment of Repair Parks

416. The essentials of repair equipment are as follows:

(a) Simplicity, in order to facilitate purchase, distribution, and re-supply.

(b) Subdivision into:
   Equipment of the Soldier;
   Individual Tool Kits—M. T. C.
   Individual Vehicle Equipment;
   Service Park Equipment, Mobile, M. T. C.;
   Service Park Equipment, Immobile, M. T. C.;
   Repair Section Equipment—M. T. C.;

Repair Group Equipment—M. T. C.;
Repair Unit Equipment—M. T. C.;
Reception Park Equipment— M. T. C.;
Reconstruction Park Equipment—M. T. C.;

417. The M. T. C. equipment must be uniform insofar as the reappearance of similar articles in different equipments is concerned. The different equipments must dovetail with each other so that the individual mechanic, coming off the transport gangplank with his hand tool equipment (the counterpart of the individual equipment of the infantry soldier), is ready to proceed by any available transportation to an open field filled with motor transportation awaiting service repair, in order that he can immediately begin work, without even spare parts for replacement. If he belongs to a service park unit, or if he belongs to a repair unit, the service park equipment or the section equipment should accompany his party, if practicable. If not, it comes up to the service park personnel, or the section personnel, as early as is practicable; whereupon the personnel begins to function under either the normal conditions for service park, or in the first stage of an overhaul park. When the group equipment comes up, it enables the personnel of two to six sections to function in an intermediate stage (called for convenience the quarter-size overhaul park stage). When the unit equipment arrives, it dovetails with all the previous equipment received and, as soon as it is installed, the several sections and groups begin to function under the normal conditions for overhaul (reception) park. The addition of reconstruction park equipment and the necessary personnel will produce a reconstruction park.

Working Surplus in Organizations

418. Experience demonstrates that the quantity of equipment to be supplied need not exceed the requirements of the authorized strength of an organization in that class of equipment to which tools, machine tools, working utensils and facilities belong. It is necessary to allow only 5% over the requirements of the authorized strength of organizations for such equipment as clothing. The number of sick, absentees and unfilled vacancies provides for an adequate working surplus. When equipments are short—as they always are with an expanding military force—the available surplus must not be in the hands of individual organizations, but it must be retained in central depots where its disposition can be controlled and the total surplus kept at a minimum.

Pyramiding of Basic Equipments

419. The conditions imposed by military organization and campaign conditions compels the Supply Department to follow a plan of pyramiding basic tool kits and equipments, which parallels and dovetails with the pyramiding of the man power of the army through basic military organizations suited to a great variety of purposes and so placed in equality or in subordination to each other as to produce the personnel side of the fighting machine.

420. As has been stated in the preceding paragraph, military organization is a problem of duplicating many, many times the organization of a basic unit, grouping this basic unit into a higher organization, attaching certain headquarters personnel, then combining these groups into a still higher organization, attaching a new headquarters personnel, and so continuing, until the

flood of incoming man power is so separated, classified and placed that it can be said to be organized. In other words it is ready to begin training and finally operating as part of the military machine. The Supply Department and the officers charged with organization, therefore, must have a parallel set of equipment lists so that they need concern themselves only with turning out rapidly organizations fitted to accomplish as limited a number of the purposes as possible. Whenever shades of specialization enter, organization and equipment is very greatly retarded. It is therefore futile to expect the organizing and equipping machinery at home to take into consideration which of the following circumstances will govern the operation of one repair unit and which will govern the operation of others:

(a) Sixteen (16) Sections working in separate localities;

(b) Four (4) Groups working independently in as many places, each Group with an attached Service Park Unit;

(c) Complete Repair Unit working in one place, with one or more attached Service Park Units;

(d) Two or more Repair Units grouped with necessary Service Park Units in a Reconstruction Park.

The conditions under which any Service Park Unit or Repair Unit will work can only be determined by the pressing demands of the moment at the time of their arrival in the zone in which they are to be employed.

How Apparent Disadvantages of Multiple Supply System Disappear

421. Study of the distribution of personnel best suited to these four conditions of operation shows that the multiple system gives too many welders, blacksmiths, vulcanizers, tire press men, etc., when operating under conditions (c) and (d), hence advantage must be skillfully taken of the ability of many men to work at more than one vocation. This ability can be approximated to a fairly close degree by a study of the different vocations so that insofar as supply of tools is concerned, the requirements can be very carefully determined for the general case, leaving only the details of selection of men particularly suited to change of vocation to the proper officers when necessity requires. Specialization to the degree practiced in factory experience is not possible in miltary service because of the necessity for changing almost at a moment's notice the whole plan and scheme of operation of a unit to suit changing military conditions. In this connection attention is invited to the discussion of the Tables of Organization in paragraphs 2 and 3, and to paragraphs 107, 108, 109 and 110, «Trend Toward Specialization from Small to Large Units.»

422. The multiple system, at first blush, apparently fails because it produces too many individual tool kits for welders, blacksmiths, vulcanizers, tire press men, etc. This bears out, for these particular individual tool kits, the statement in paragraph 418, «Working Surplus in Organizations,» but apparently results in a shortage somewhere else. Study of the composition of the individual tool kits will show that they are practically all based on individual tool kit No. 1 for Chassis Repair Mechanics, hence this apparent shortage is not a real one. A surplus is objectionable in principle as being uneconomical. When it does exist, it is the price paid to fit the organization to meet any of the military conditions for which it was designed. There is an easy means for converting this apparent fault in the case of a repair unit into

a valuable asset. This is done by determining and recording exactly what tools of the Repair Section are rendered surplus when the Section works in a park manned by:

(a) A Repair Group and Service Park Unit;

(b) A Repair Unit and Service Park Unit;

(c) Two or more Repair Units and the necessary Service Park Units.

423. The question as to under which condition a newly arriving Repair Unit will work having been determined, it is at once known what surplus exists in that unit and exactly the extent to which its equpiment may be drawn upon to fill emergencies because of the nonarrival of depot supplies of tool equipments. If the surplus tools are withdrawn, everyone concerned knows exactly the extent to which the flexibility of the Unit for meeting other conditions has been temporarily injured. It has been the custom to call upon the earliest arriving units for a division of their tools to meet emergencies, but it has not heretofore been possible to have as exact a measure of just what making such a call will mean.

Comparison of Vocations and Individual Tool Kit Equipment in Repair Organizations

424. The table below shows how individual tools kits are assigned to men in repair organizations. It also shows the number of each kind required in each type of organization, to just what degree the pyramiding plan works out smoothly, and the surplus which becomes available in emergency for withdrawal under the conditions named in paragraphs 423 and 438.

425. The line of totals just below «Battery Repair Mechanic» is the arithmetical sum of the figures above. The line «Total Productive Men» is derived from the «Distribution and Productivity» tables. The «Total Men Requiring Tools» is determined by subtracting the number of «Helpers With No Tools» obtained from the table designated by that name, and adding the number of non-productive men from the table «Non-productive Men Equipped with Tools.». When the number of «Kits Supplied» differs from «Total Men Requiring Tools,» the difference is explained by the table «Extra Kits Supplied Over Number of Mechanics.» The «Kits in Service Park Multiples» line is simply the multiple of the Immobile Service Park equipment shown for purposes of comparison. The reasons for assigning more Chassis Repair Mechanics Tool Kits No. 1 than there are men classified in that vocation is explained in the table «Helpers Supplied with Individual Tool Kit No. 1» The other lines are self-explanatory. Axle and Transmission Mechanics use Individual Tool Kit No. 1.

426.

Helpers with No Tools

Vocations	Individual Tool Kit No.	Service Park Unit	Section	Group	Repair Unit
Blacksmith	2	1	2	3	15
Rad. and Sheet Metal...	9	1	1	0	0
Trimmer	10	0	0	0	1
Tire Press	11	1	2	*1	1
Battery Repair	14	0	0	0	4
		3	5	*4	23

*One tire press helper works as assistant vulcanizer and one without tools.

	COLUMN NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
			SERV. PARK UNIT				REPAIR SECTION				REPAIR GROUP					REPAIR UNIT				
			Mobile		Immobile															
			Men	Eq.	Men	Eq.	Men		Equip.		Men		Equip.			Men		Equip.		
Line Number	VOCATION	Individual Tool Kit Number					Multiple of S.P.U.	Distribution and Productivity Table	Multiple of I. S. P. U.	Allowance	Multiple of Section	Distribution and Productivity Table	Allowance	Working	Surplus	Multiple of Section	Distribution and Productivity Table	Allowance	Working	Surplus
1	Chassis Repair Mechanic	1	a7	a9	a7	a9	14	a18	18	a22	72	a59	88	a74	14	288	a278	352	a352	0
2	Blacksmith	2	2	1	2	1	4	4	2	2	16	7	8	4	4	64	31	32	16	16
3	Motorcycle Mechanic	3	3	3	3	3	6	6	6	6	24	19	24	19	5	96	90	96	90	6
4	Carpenter and Wheelwright	4	2	2	2	2	4	3	4	3	12	11	12	11	1	48	46	48	46	2
5	Welder	5	2	1	2	1	4	2	2	1	8	6	4	3	1	32	20	16	10	6
6	Motor Mechanic	6	2	1	2	1	4	6	2	4	24	28	16	16	0	96	120	64	64	0
7	Machinist	7	1	1	1	1	2	2	2	2	6	7	8	7	1	32	40	32	32	0
8	Electrician and Carburetor Mechanic	8	1	1	1	1	2	3	2	2	12	7	8	7	1	48	27	32	27	0
9	Radiator and Sheet Metal Mechanic	9	2	1	2	1	4	3	2	2	12	7	8	7	1	48	31	32	31	1
10	Trimmer	10	0	1	0	1	0	1	2	1	4	3	4	3	1	16	17	16	16	0
11	Tire Press Mechanic	11	2	1	2	1	4	4	2	2	16	*3	8	*2	6	64	6	32	3	29
12	Painter	12	0	1	0	1	0	2	2	2	8	3	8	3	5	32	19	32	19	13
13	Vulcanizer	13	1	1	1	1	2	1	2	1	4	*1	4	*2	2	16	6	16	6	10
14	Battery Repair Mechanic	14	0	...	0	1	0	0	2	1	0	2	4	2	2	0	12	16	8	8
15	TOTAL	...	25	24	25	25	50	55	50	51	220	163	204	160	44	880	748	816	720	96
16	Total Productive Men	...	25	...	25	...	50	55	...	...	220	154	....	....	...	880	710	....	....	...
17	Total Men Requiring Tools	..	22	22	22	22	50	50	...	50	....	160	...	204	...	......	720	....	816	...
18	Kits Supplied, Manual Table	...	...	24	...	25	...	...	...	51	....	....	....	....	...	......	......	....	....	...
19	Kits in Service Parks, Multiples	...	...	...	...	25	...	...	50	50	....	....	200	....	...	......	......	800	....	...
20	Drivers	...	2	...	2	...	4	1	...	...	4	8	....	....	...	16	40	....	....	...
21	Laborers and Orderlies	...	2	...	2	...	4	4	...	...	16	59	....	....	...	64	181	....	....	...
22	Camp and Mess	...	1	...	1	...	2	3	...	...	12	24	....	....	...	48	80	....	....	...
23	Supply and Property	...	2	...	2	...	4	4	...	...	16	13	....	....	...	64	55	....	....	...
24	Inspectors and First Sergeants	...	2	...	2	...	4	2	...	...	8	12	....	....	...	32	48	....	....	...
25	Clerks	...	0	...	0	...	0	3	...	...	12	12	....	....	...	48	48	....	....	...
26	Foremen	...	1	...	1	...	2	1	...	...	4	15	....	....	...	16	32	....	....	...
27	Total Non-Productive Men	...	10	...	10	...	20	18	...	...	72	143	....	....	...	288	484	....	....	...
28	Aggregate Enlisted Men	...	35	...	35	...	70	73	...	...	292	297	....	....	...	1168	1194	....	....	...

REMARKS:—(a) Certain helpers are equipped with Individual Tool Kit No. 1. See Table "Helpers supplied with Individual Tool Kit No. 1."
* One Tire Press Helper works as Assistant Vulcanizer and one without tools.

Non-Productive Men Equipped with Tools

428.

Vocations	Individual Tool Kit No.	Service Park Unit	Section	Group	Repair Unit
Wheelwright	4	0	0	4	12
Power and Electrician	8	0	0	2	8
Rad. & Sheet Met. Mech.	9	0	0	2	8
Plumber	9	0	0	1	4
Plater	14	0	0	0	1
		0	0	9	33

Extra Kits Supplied Over Number of Mechanics

429.

Vocations	Individual Tool Kit No.	——Service Park——		Section	Group	Repair Unit
		Mobile	Immobile			
Trimmer	10	1	1	0	0	0
Painter	12	1	1	0	0	0
Vulcanizer	13	0	0	0	*1	0
Battery Repair	14	0	1	1	0	0
		2	3	1	*1	0

* One tire press helper works as assistant vulcanizer and one without tools.

Helpers Supplied with Individual Tool Kit No. 1

430.

Vocations	Service Park Unit	Section	Group	Repair Unit
Welders	1	1	3	10
Motor Mechanics	1	2	12	56
Elec. and Carb. Mech's	0	1	0	0
Machinist Helpers	0	0	0	8
	2	4	15	74

Systematizing Equipment Supply Methods

431. Expedition in the supplying of equipment requires a careful preparation of kits, equipments, lists, tables and containers which will match, insofar as conditions can be foreseen, the program by which the maintenance personnel will be fed into the areas where they are to be equipped. The supply program for handling equipment must be built with sufficient flexibility so that it may meet changing conditions and programs for feeding the maintenance personnel into the maintenance areas. In other words, where a tool kit, a tool kit list, and tool kit container, can be made to answer several purposes, supply will be greatly expedited by the elimination of minute and unnecessary differences in the composition of the kits.

Pitfalls for the Supply Departments Which Can Be Eliminated

432. The Supply Department is not infrequently defeated in giving the prompt service which is always their aim, by such a trivial obstacle as having two slightly different names for the same tool kit or equipment, with trivial and unnecessary differences in the nomenclature of the individual tools. If sufficient care had been taken to foresee the conditions which always confront any supply service, it would be very evident that with an expanded and partially trained supply personnel, a demand for a tool kit under one of the two names would either not be filled because the inexperienced man directly concerned with filling the call would state that the kit was not on hand because he knew the kit desired by the other name, or supply would be delayed until the over-burdened directing supply man of experience could unearth and detect the cause of delay.

Methods Which Improve Supply Service

433. The greatest expedition in supply can be obtained by working out kits and equipments in detail and by carrying from 80 to 90% of the available supply in such kits and equipments, leaving a reservoir of 10 to 20% of the stock where it can be obtained item by item without breaking into the made-up kits and equipments. There should be on hand a supply of kits and equipment containers, packing material, lumber, etc. Organizations in the field should be supplied with complete new kits and equipments upon the return or exchange of their old kits or equipments with some articles missing and others disabled. This policy is not different from that followed by other supply departments in re-equipping individuals and organizations. It means a large reduction in paper work and throwing the salvaging, repair and replacement of equipments on other service of supply organizations whose reasons for existence are exactly that.

Care Necessary to Avoid Duplication of Equipments

434. Great care must be used in all communications to adhere to the central idea of this pyramiding plan, namely, the equipment symbol designation applies to the increment equipment only, which, added to multiples of some smaller equipment or equipment increment, completes the equipment for a given purpose. This is shown by the following table:

Component Parts of M. T. C. Repair Park Equipments

GENERAL EQUIPMENT NOT SUPPLIED BY M. T. C.

	Symbol Designation	Estimated Wt. of Increment in Lbs.
Equipment on person, enlisted men..........		20
Equipment, baggage, overseas, below grade 1[illegible]		75
Equipment, baggage, overseas, above grade 1[illegible].		100
Equipment, unit camp and garrison. (This varies with the size and type of military unit, service conditions, season of the year, etc.)......		?

EQUIPMENTS SUPPLIED BY M. T. C.

Individual Tool Kits:

	Symbol Designation	Estimated Wt. of Increment in Lbs.
Chassis Repair Mechanic	1	23
Blacksmith	2	110

Motorcycle Mechanic	3	**19**
Carpenter and Wheelwright	4	**70**
Welder	5	**26**
Motor Mechanic	6	**31**
Machinist	7	**33**
Electrical and Carburetor Mechanic	8	**10**
Radiator and Sheet Metal Mechanic	9	**20**
Trimmer	10	**5**
Tire Press Mechanic	11	**29**
Painter	12	**5**
Vulcanizer	13	**15**
Battery Repair Mechanic	14	**17**
Total For One Kit of Each		**413**
Average (Approximately)		30

Individual Truck Equipment, including cargo body	MT	*1800
Individual Motor Car Equipment	MCr	250
Individual Motorcycle Equipment	MCy	48
Individual Trailer Equipment	T	0
Machine Shop Truck Increment (over MT except cargo body and Individual Kits)	MST	9300
Light Repair Truck Increment (over MT except cargo body and Individual Kits)	LRT	280
Motorcycle Repair Truck Increment (over MT except cargo body and Individual Kits)	MRT	200

* 3-ton body, 1200 lbs.

	Symbol Designation	Estimated Wt. of Increment in Lbs.
Tire Press Trailer Increment (over T and Individual Kits)	TPT	4900
Wrecking Truck Increment (over MT and Individual Kits)	WT	1257
Tractor Equipment	1 Tr	400
Tank Truck Increment (over MT except cargo body	1 Tank	600
Ambulance Increment (over MT except cargo body	1 Amb	200
Stockroom Trailer Increment (over T except cargo body)	ST	1000
Service Park, Mobile, Increment (over 6 MT, 1 MCr, 2 T, 9 Kits No. 1, 1 No. 2, 3 No. 3, 2 No. 4, 1 each Nos. 5 to 13 inclusive, 1 MST, 1 LRT, 1 MRT, 1 TPT, 1 WT, and 1 ST carried with personal equipments and Unit C. and G. E. on 2 cargo trucks, Class B)	SPM	3033
Service Park, Immobile, Increment (over 1 MT, 1 MCy, 9 Kits No. 1, 1 No. 2, 3 No. 3, 2 No. 4, 1 each Nos. 5 to 14 inclusive, 1 MST, 1 LRT—special body not excepted, 1 MRT, 1 TPT and 1 ST—special bodies excepted unless otherwise noted)	SPI	3924
Repair Section Increment (over 22 Kits No. 1, 2 No. 2, 6 No. 3, 3 No. 4, 1 No. 5, 4 No. 6, 2 No.		

	Symbol Designation	Estimated Wt. of Increment in Lbs.
7, 2 No. 8, 2 No. 9, 1 No. 10, 2 No. 11, 2 No. 12, 1 No. 13, and 1 No. 14. Its composition is exactly the same as Service Park, Immobile, Increment plus 3 MT, 1 WT, 1 T, 1 MST, 1 LRT —special body not excepted, 1 MRT, 1 TPT, and 1 ST—special bodies excepted unless otherwise noted.)	RS	18204
Repair Group Increment (over 88 Kits No. 1, 8 No. 2, 24 No. 3, 12 No. 4, 4 No. 5, 16 No. 6, 8 No. 7, 8 No. 8, 8 No. 9, 4 No. 10, 8 No. 11, 8 No. 12, 4 No. 13, 4 No. 14, 8 MT, 1 WT, 1 Tank, 1 Amb, 2 T, 4 MCy, and 1 Tr)	RG	41311
Repair Unit Increment (over 352 Kits No. 1, 32 No. 2, 96 No. 3, 48 No. 4, 16 No. 5, 64 No. 6, 32 No. 7, 32 No. 8, 32 No. 9, 16 No. 10, 32 No. 11, 32 No. 12, 16 No. 13, 16 No. 14, 25 MT, 4 WT, 2 Tank, 2 MCr, 4 Tr, 8 T, and 14 MCy)	RU	127369

*Note: It will be noted that the symbol «MT» includes the standard cargo body. The fact must be kept in mind that when a truck is converted to a Machine Shop Truck or other special type, the cargo body is replaced by a special body. Therefore the «Increments» must be «over MT except body, Individual Kits,» etc.

Equipment of the Soldier

435. The equipment of the soldier in a Service Park Unit is that prescribed as the Personal (Individual) Equipment for Truckmasters and Mechanics, in Par. 542, Manual of the Motor Transport Corps.

436. The equipment of the soldier in Repair Sections (except for seven (7) noncommissioned officers above the grade of Sergeant and except for two (2) cooks), in Repair Groups (except for one (1) Sergeant 1-c) and in Repair Unit headquarters (except for one (1) Sergeant 1-c) is the Personal (Individual) Equipment for all enlisted men of Motor Truck Companies except Truckmasters and Mechanics, as prescribed in Par. 542, Manual of the Motor Transport Corps. The equipment for the seven (7) noncommissioned officers above the grade of Sergeant and the two (2) cooks of each Repair Section, the one (1) Sergeant 1-c in each Repair Group Headquarters, and the one (1) Sergeant 1-c in each Repair Unit Headquarters, is the Personal (Individual) Equipment prescribed for Truckmasters and Mechanics.

Individual Tool Kits

437. All mechanics are to be supplied with the authorized clothing. Particular attention will be given to equipping each mechanic with one pair of leather gloves, one one-piece fatigue suit and one blue denim fatigue cap.

438. If the case arises where the items in these kits cannot be supplied as specified, substitutes will be accepted.

439. Rigid adherence to sizes and types is not required. Substitutions should be made with such caution as will not seriously impair the capacity and suitability of the several kits.

440. These kits are supplied to all M. T. C. maintenance soldiers whose duties require them. The quantities of each, supplied to parks of various size, are designated in these standardized equipment lists.

441. The M. T. C. soldier's individual tool kit is issued to him in the same manner as is an infantry equipment to an infantry soldier. These individual tool kits *are not shop equipment.* They are, as their name implies, *individual equipments.* Under no circumstances will anyone presume to order M. T. C. maintenance mechanics to give up their individual tool equipments, except when they are to be discharged or mustered out of the service, or when by promotion, demotion, or other cause, their vocation and requirements change. Individual tool equipments are inseparable from the M. T. C. soldier during moves under the conditions which apply to an infantry soldier. *Individual tool equipments marked or designated for delivery to certain units or enlisted men will not be diverted to other purposes except on explicit orders from the Director of the Motor Transport Corps.* No exceptions to this rule will be countenanced. This rule must not be construed, however, as prohibiting the use of the same equipment by more than one soldier, inasmuch as when a shortage of tools exists, men may use each other's tools under such conditions as will adequately protect and safeguard the interests of the soldier to whom the tools were assigned against loss or damage not incident to fair wear and tear in the service . The use of an individual tool equipment by more than one motor transport mechanic will be regulated by their Commanding Officer.

INDIVIDUAL TOOL KITS

Chassis Repair Mechanic

442.

Kit No. 1—Weight 23 Lbs.

This kit will act as a standard from which other kits are to be based. This kit consists of the following items:

1	Bag, tool, waterproof canvas, 18-in.
3	Chisels, cold, one each, 3/8-in., 3/4-in., flat, 1/4-in. cape.
1	Can, oil, 1/2-pt.
1	Cotter pin extractor.
4	Drifts, one each: steel 1/8-in., 1/4-in., 3/8-in. and 1-in. brass.
3	Files, one each: 6-in. half round bastard, 10-in. round bastard, 10-in. mill bastard.
3	File handles.
1	Hammer, machinist's ball pein, 1 1/4-lbs.
1	Punch, center, 3/8-in.
1	Pliers, 6-in. combination, Utica.
1	Putty knife, 1-in. blade.
3	Screw drivers, one each: 10-in. and 14-in. Perfect handles, 6-in. bull dog.
2	Screw drivers, off-set, 5-in. by 1/4-in., 8-in. by 7/16-in.
1	Scale, 6-in. flexible, graduated in 64ths, 32nds, 16ths and 8ths.
1	Wrench, monkey, 14-in. steel handle.
2	Wrenches, Crescent, 8-in. and 12-in.
7	Wrenches, open end, semi-finished, milled openings as follows: 3/8-in. and 7/16-in.; 1/2-in and 9/16-in.; 5/8-in. and 7/8-in.; 13/16-in. and 1-in.; 1 1/16-in. and 1 1/4-in.; 25/32-in. and 31/32-in.; 3/4-in. and 7/8-in.
3	Wrenches, bent end socket, 5/16-in.; 3/8-in., 1/2-in

Blacksmith

Kit No. 2—Weight 110 Lbs.

1 Apron, leather, Gray and Dudley No. 22.
1 Anvil, small, 50 lbs.
1 Chest, tool, with handles and padlock.
2 Chisels, with handles, hot 1 1/2-in., cold 1 1/2-in.
1 Chisel, cold, 3/4-in. flat.
1 Caliper, double, 6-in. and 12-in.
1 Dividers, 12-in., wing.
3 Files, 12-in. round bastard, 12-in. mill bastard, 12-in. half round bastard.
1 Fuller, Top, 3/4-in.
1 Hammer, machinist's ball pein, 2 lbs.
3 Handles, file.
1 Hardie, to fit anvil hole.
1 Pritchel (taper punch), 3/16-in.
1 Rule, 2-ft. brass, folding.
1 Screw Plate, U. S. std. threads, 1/4-in. to 1-in., by 16ths.
3 Swages, top, 3/8-in., 1/2-in., 3/4-in.
3 Swages, bottom, 3/8-in., 1/2-in., 3/4-in.
1 Tongs, 22-in., straight lip.
1 Tongs, 22-in., bolt, 3/4-in.
1 Visc, small, 4-in. jaws.
1 Wrench, monkey, 14-in., steel handle.
1 Wrench, crescent, 8-in.

Motorcycle Mechanic

Kit No. 3—Weight 19 Lbs.

1 Bag, tool, 18-in. waterproof canvas.
2 Chisels, 3/8-in. flat, 1/4-in. cape.
1 Can oiler, 1/2 pt.
1 Cotter pin extractor.
4 Drifts, one each, brass 3/8-in., steel 1/8-in., 1/4-in., 3/8-in.
3 Files, 10-in. mill, 2nd cut, 10-in. round bastard, 6-in. half round bastard.
3 File handles.
1 Gauge, thickness, .0015-in. to .015-in. Starrett No 172.
1 Hammer, machinist's ball pein, 1 1/4 lbs.
1 Punch, center, 3/8-in.
1 Pliers, 6-in. combination, Utica.
4 Screw drivers, one each 6-in. and 10-in. Perfect handle, 6 in. bull dog, 5-in. by 1/4-in. off-set.
1 Tool Kit for Harley Davidson or Indian Motorcycle.
2 Wrenches, crescent, 6-in. and 8-in.
1 Wrench, spoke nipple.
3 Wrenches, bend end socket, 5/16-in., 3/8-in., 1/2-in.
5 Wrenches, open end, semi-finished milled openings as follows: 3/8-in. and 7/16-in., 25/32-in. and 31/32-in., 1/2-in. and 9/16-in., 3/4-in. and 7/8-in., 5/8-in. and 7/8-in.

Carpenter and Wheelwright

Kit No. 4—Weight 70 Lbs.

1 Ax, hand.
1 Auger, hollow, adjustable, 1/4-in. to 1 1/4-in.

8 Bits, auger, 3/16-in., 1/4-in., 3/8-in., 1/2-in., 5/8-in., 3/4-in., 7/8-in., 1-in.
1 Bit, Screw driver.
1 Brace, ratchet, 12-in.
1 Chest, tool, with handles and padlock.
8 Chisels, socket, firmer, 1/4-in., 3/8-in., 1/2-in., 5/8-in., 3/4-in., 1-in., 1 1/2-in., 2-in.
1 Dividers, 6-in.
3 Files, saw, taper, 6-in.
1 Gauge, thumb, mortise.
1 Hammer, claw, 1 lb.
1 Knife, draw, 10-in.
3 Nail sets, 1/16-in., 3/32-in., 1/8-in.
1 Oil can, 1/2-pt.
1 Plane, jointer, 24-in. }
1 Plane, jack, 15-in. } Steel
1 Plane, smooth, 8-in. }
1 Rasp, wood, 12-in.
1 Rule, 2 foot.
1 Saw, hand, cross cut, 9 or 10-point, 26-in.
1 Saw, hand, rip, 5-point, 28-in.
1 Set of saws, compass, with handle and blades, 14-in.
1 Screw driver, 10-in. perfect handle.
1 Set, saw .
1 Spoke pointer.
1 Square, try, 7 1/2-in.
1 Square, steel 2 foot.
1 Stone, oil, double face.
1 Vise, 4-in. jaw.
1 Wrench, monkey, 10-in.

Welder

Kit No. 5—Weight 26 Lbs.

1 Apron, leather, Gray and Dudley No. 22.
1 Bag, tool, waterproof canvas, 18-in.
5 Chisels, 3/4-in. flat, 3/8-in. flat, 1/4-in. cape, 2 diamond point, 5/8-in.
3 Files, 12-in. round bastard, 12-in. mill bastard, 12-in. half round bastard.
3 File handles.
1 Gloves, leather.
1 Goggles, dark, spare.
2 Hammers, machinist's ball pein, 1 1/4 lbs. and 2 lbs.
2 Pliers, 6-in. combination, Utica.
1 **Welding outfit to consist of:**
  1 Welding torch, with tips.
  1 Oxygen regulator.
  1 Acetylene regulator.
  25 Feet of black hose.
  25 Feet of red hose.
  2 Wrenches to fit connections.
  1 Spark lighter.

Motor Mechanic

Kit No. 6—Weight 31 Lbs.

This kit is to consist of one Chassis Repair Mechanic's tool kit, complete, plus the following items:

12 Blades, hack, saw, 12-in.

1	File card.
1	Gauge, thickness, .0015-in. to .015-in., Starrett No. 172. ,
1	Hack saw frame, adjustable, 6-in to 12-in.
1	Hammer, brass, 2 lbs.
1	Screw driver, 6-in., perfect handle.
1	Scrapers, bearing, set of three (motor mechanics only).

Machinist

KIT No. 7—Weight 33 Lbs.

This kit is to consist of one Chassis Repair Mechanic's tool kit, complete, plus the following items:

1	Breast drill, to take straight shank drills up to 1/2-in.
2	Calipers, outside, 6-in., inside, 6-in.
1	Dividers, spring, 6-in.
1	Guage, thread, 30 pitches, 6 to 60, V thread, Starrett No. 473.
1	Gauge, center, U. S. Std., 60 degrees, B. & S. No. 650.
1	Micrometer, 1-in. to 2-in. combination, in case.
1	Set of straight shank drills, 1/8-in to 1/2-in. by 16ths.

Electrical and Carburetor Mechanic

KIT No. 8—Weight 10 Lbs.

1	Bag, tool, waterproof canvas, 18-in.
1	Blow torch, 1-quart size.
1	Can, oil, 1/2 pt.
2	Chisels, 3/8-in. flat, 1/4-in. cape.
3	Drifts, steel, 1/8-in., 1/4-in., 3/8-in.
3	Files, two 4-in. platinum, 8-in. smooth mill, 6-in. half round bastard. 6-in. needle
2	File handles.
1	Hammer, machinist's ball pein, 1 1/4 lbs.
1	Knife, navy.
1	Punch, center, 3/8-in.
2	Pliers, 4-in. long nose, side cutting, 6-in. combination, Utica.
5	Screw drivers, one Valley Pet, 6-in. bull dog, 6-in. perfect handle, 3/16-in. by 3-in. Champion electrician, 5-in. by 1/4-in. offset.
2	Soldering irons, 1 lb. and 3 lbs.
2	Wrenches, crescent 6-in. and 8-in.

Radiator and Sheet Metal Mechanic

KIT No. 9—Weight 20 Lbs.

1	Bag, tool, waterproof canvas, 18-in.
1	Blow torch, one quart size.
1	Brush, 2-in. by 6-in., wire bristles.
1	Chisel, cold, 3/4-in. flat.
3	Drifts, steel, 1/8-in., 1/4-in., 3/8-in.
3	Files, 12-in. mill bastard, 10-in. half round bastard, 10-in round bastard.
3	File handles.
2	Hammers, tinner's riveting, 8 oz. and 1 lb.
1	Mallet, round wooden, 2 1/2-in. face.
1	Pliers, 8-in. combination, Utica.
1	Pliers, very long reach, flat nose, 6-in., Utica.
8	Rivet sets, Nos. 00, 0, 1, 2, 3, 4, 5, 6.
1	Scriber, 8-in.

3	Screw drivers, 6-in, 10-in., 14-in. perfect handle.
3	Snips, compound lever, 12-in. and 14-in., circular back 12-in.
2	Soldering irons, 1 lb. and 3 lbs.
1	Steel rule, 3-foot, 3-fold.
1	Wrench, monkey, 8-in. steel handle.
2	Wrenches, open end, Nos. 25 and 27.
2	Wrenches, Walden Worcester Speed, 1/4-in. and 5/16-in.

Trimmer

Kit No. 10—Weight 5 Lbs.

1	Awl, sewing, with handle, Stewart Automatic.
1	Bag, tool, waterproof canvas, 18-in.
1	Chisel, cold, 3/8-in. flat.
1	Hammer, upholstered, 6 oz., with claw tool
1	Knife, sharp point, 3-in. blade.
6	Needles, curved, 2-in.
6	Needles, curved, 3-in.
6	Needles, curved, 4-in.
1	Package of needles, glover's, No. 0.
1	Package of needles, glover's, No. 00.
1	Package of needles, glover's, No. 000.
1	Palm, sailmaker's.
1	Punch, oval, for curtain fasteners.
1	Punch, round, for sail grommets.
1	Punch, leather and washer set: 1/8-in. dia., 9/16-in. dia., 5/32-in. dia., 3/8-in. dia., 1/4-in. dia., 3/4-in. dia., 5/16-in. dia., 7/8-in. dia., 1/2-in. dia., 1-in. dia.
1	Regulator, trimmer's.
1	Rule, 6-foot, folding.
1	Shears, 10-in., trimmer's.
1	Shears, 6-in., sewing.
1	Screw driver, 10-in., perfect handle.
1	Stuffing iron, trimmer's.
2	Thimbles, open end.

Tire Press Mechanic

Kit No. 11—Weight 29 Lbs.

This kit is to consist of one Chassis Repair Mechanic's Tool Kit, complete, plus the following items:

2	Chisels, cold, 5/8-in. and 1-in, flat.
1	Hack saw frame, 18-in.
12	Hack saw blades, 18-in.
1	Hammer, machinist's ball pein, 1 1/4 lbs.
1	Knife, rubber cutting, 6-in. by 1-in.

Painter

Kit No. 12—Weight 5 Lbs.

1	Bag, tool, waterproof canvas, 18-in.
1	Brush, steel bristles, 2-in. by 6-in.
2	Brushes, round for cleaning, 1-in. and 1 1/4-in. dia.
4	Brushes, paint, 3-in. flat, 1 1/4-in. flat, 3/4-in. flat, No. 4 marking.
1	Brush, stencil.
1	Brush, dusting, 1 1/2-in. dia.
1	Putty knife, 1-inch blade.

Vulcanizer

Kit No. 13—Weight 15 Lbs.

1 Bag, tool, waterproof canvas, 18-in.
1 Brush, steel bristles. 2-in. by 6-in.
1 Brush, cement
1 Knife, square point, 6-in. by 1-in.
1 Knife, notched 1-in. by 1-in.
1 Knife, taper point, 5-in.
1 Pliers, combination, 6-in.
1 Pliers, long round nose, 5-in.
1 Roller, concave, 2-in. by 2-in.
1 Roller, flat, 1 1/2-in. by 1 1/2-in.
1 Shears, rubber cutting, 8-in.
1 Valve tool.
1 Vulcanizer, Shaler or Lowell, knocked down and boxed.

Battery Repair Mechanic

Kit No. 14—Weight 17 Lbs.

1 Acid filler, bulb syringe.
1 Bag, tool, waterproof canvas, 18-in.
1 Blow torch, one-quart size.
1 Brush, paint, 2-in. flat.
2 Brushes, wire, 3 rows, 1 1/2- in. bristles.
1 File, 10-in. mill open cut.
1 Gloves, rubber.
1 Hammer 1 lb. carpenter's claw.
1 Hydrometer, unbreakable.
1 Nippers, 10-in., for lead cutting.
1 Pliers, gas, 8-in.
2 Pliers, flat nose, 6-in.
1 Putty knife, 1-in. blade.
1 Punch, center, 3/8-in.
1 Pitcher, hard rubber, one-quart size.
1 Rule, wood, 24-in.
1 Scraper, triangular.
1 Screw driver, 6-in. perfect handle.
1 Still, water, earthen ware, capacity 1/2 gal. per hour, Laler.
1 Wax pot.
1 Wrench, crescent, 8-in.

Unit Vehicle Equipment

443. To determine the proper equipment for individual vehicles reference should be made to Paragraphs 539, 540 and 541, Manual of The Motor Transport Corps. The paragraphs enumerated show in detail Unit Motorcycle Equipment, Unit Truck Equipment and Unit Passenger Car Equipment, respectively.

Equipment for Light Repair Truck

444. This equipment shall consist of the following:

2 Individual Tool Kits No. 1, «Chassis Repair Mechanic,» (issued to mechanics on truck);
1 Unit Truck Equipment (See Par. 540, Manual of The Motor Transport Corps).

The following increment of equipment, when added to the above Individual Tool Kits and Unit Equipment, forms one (1) complete equipment for a Light Repair Truck:

1	Drill, Breast, two-speed, ball bearing adjustable, 3-jaw chuck for straight shank drills, 0 to 1/2-in., with chain attachment.
1	Wood block with cover, to hold set of jobber's drills, 1/16-in. to 1/2-in., by 16ths, straight shank.
1	Vise, 4 1/2-in. jaws.
1	Blow torch.
1	Snips, 12-in. tinner's, straight.
2	Soldering Coppers, one each, 2 lbs. and 3 lbs.
1	Geared hand grinder, 6-in. wheel.
1	Hydrometer, packed in case.
1	Double, steel block, for 1-in. manila rope, with becket, 8-in., BB with safety link hook.
1	Single, steel block, for 1-in. manila rope, with becket 8-in., BB with safety link hook.
100	Feet, best manila rope, 1-in.
1	Blacksmith's sledge, 8 lbs., straight pein, with two handles.
1	Knife, special for rubber tires, 1-in. blade, 4-in. long.
1	Each, 1/8-in. and 1/4-in. pipe plug taps
1	Spark plug tap for make of truck.
1	Double action jack, 15-ton, 12 1/2-in. lift, 21 1/2-in. height, with chain and bar.
1	Air pump, 2-cylinder, with hose and couplings.
1	Vulcanizer, 5-minute.
12	Extra boxes of patches and heating pads for vulcanizer.
1	Medium service C-clamp, 4-in.
2	Medium service C-clamps, 8-in.
1	Crowbar, 12 lbs.
1	Monkeywrench, 24-in. .

Substitutes will be accepted where the above cannot be furnished.

Equipment for Mobile Motorcycle Repair Truck

445. This equipment shall consist of the following:

3 Individual Tool Kits No. 3, «Motorcycle Mechanics» (issued to mechanics on truck);

1 Unit Truck Equipment (see Par. 540, Manual of The Motor Transport Corps).

Equipment for Mobile Service Parks

446. The following Individual Tool Kits are issued to the personnel:

9	Chassis Repair Mechanic	Kit No. 1
1	Blacksmith	Kit No. 2
3	Motorcycle Mechanic	Kit No. 3
2	Carpenter and Wheelwright	Kit No. 4
1	Welder	Kit No. 5
1	Motor Mechanic	Kit No. 6
1	Machinist	Kit No. 7
1	Electrical and Carburetor Mechanic	Kit No. 8
1	Radiator and Sheet Metal Mechanic	Kit No. 9
1	Trimmer	Kit No. 10
1	Tire Press Mechanic	Kit No. 11
1	Painter	Kit No. 12
1	Vulcanizer	Kit No. 13
0	Battery Repair Mechanic (Furnished only for Immobile Service Park)	Kit No. 14

When Any of the Equipment Called for on the Attached Lists is not Available, Furnish Nearest Substitute

The following increment of equipment, when added to the above listed Individual Tool Kits, forms one (1) complete equipment for Mobile Service Park:

Power and Machine Tool Equipment

Quantity	Description
1	Power Plant, Gasoline-Electric, 5-K. W., 110-volt, D. C. To consist of a direct current, compound-wound electric generator, direct connected to a four-cylinder, four-cycle water-cooled gasoline engine. This unit to be all complete with all accessories and to have a radiator of ample capacity with fan driven from engine, mounted in unit power plant; also to be supplied with 10-gallon tank of best construction mounted with the unit or supplied with wall brackets and 12 feet of seamless copper tubing and fittings for connection from tank to carburetor. *Set of spare parts for* power plant engine to consist of:
4	Spark plugs
2	Valves, exhaust
2	Valve springs
2	Springs, governor
4	Wrist pins
12	Piston rings—oversize
2	Cylinder head gaskets, if motor has detachable head.
4	Pair connecting rod bearings
4	Pistons—oversize
2	Camshaft bearings
2	Sets of generator brushes
1	Set of bearing linings for generator
2	Fan belts
1	Complete set of crank shaft bearings
3	Sets of rubber hose connections
1	Switchboard to be constructed of best quality, well seasoned hardwood amply reinforced to prevent warping and provided with bracets for wall mounting. To be equipped with the following:
1	75-ampere—110-volt— D. P. S. T. switchboard type, knife switch with fuse block and ten 75-ampere fuses
1	Switchboard type ammeter, D. C., scale 0 to 100 amperes, Weston make or equal.
1	Rheostat for field of generator, with extended handle for operating from front of switchboard.
1	Switchboard type D. C. Voltmeter, scale 0 to 150 volts, Weston make or equal.
3	30-ampere, D. P. S. T., switchboard type, knife switches, with 3-D. P. fuse blocks and 25 30-ampere fuses. Necessary connections, nuts, terminals, etc.
1	Grinder, Emery, Bench Type, Motor-driven, 110-volt, D. C. 2,000 R. P. M. with shaft extended both ends for taking wheels, 6-in. by 3/4-in., and equipped with wheel collars, rests, guards and 20-ft. lead of best grade, heavy braid flexible cable with attachment plug. Two extra emery wheels are to be supplied.
1	Grinder, Emery, Tool Post, electric, 110-volt, D. C., equipped with internal and external grinding attachment; 7 grinding wheels, internal and external; cross feed lever, 10-ft. cord, 1 switch and 1 attachment plug. Dunmore class A or equal.

1 Van Dorn Universal Electric drill, type D. A. O. X. or equal, suitable for 110-volt D. C., 700 R. P. M. Drilling capacity 3/8-in., fitted with 3/8-in. Horton and Morrow chuck, or equal.

1 Van Dorn, D. C., Electric Drill, or equal, suitable for 110-volt, D. C., 550 R. P. M., drilling capacity 5/8-in., fitted with 5/8-in. Horton and Morrow chuck.

1 Van Dorn (code 1230) bench drilling stand with code 1221 swivel stud and code 1243 swivel base to hold one electric drill. When other drills are substituted, furnish necessary stand.

1 Special Liberty Screw Cutting Engine Lathe; Size 12-in. by 6-ft. to take 42-in. between centers. This lathe is special in that it is a pedestal type which forms a part of the bed. The base of the pedestal to be 24-in. long by 13-in. wide, provided with four holes for bolting to a bench. The bed will be so constructed that the chips and cuttings will drop between the way and be discharged behind the machine on a suitable spout. On the rear of the pedestal will be mounted a 1 1/4-H. P. Reliance Motor, 110-volt, D. C., type «AS,» frame «C» with armature shifting design, having mitre gear attachment for speed control and necessary operating handle placed in front of the machine, convenient to the operator, speed 600 to 1800 R. P. M., complete with one Electric Controller & Manufacturing Company, Bulletin 1017, form «A,» current Limit Automatic Starter with 1 H. R. B. operating switch, having a starting point dynamic brakeshift and reversed position; also sheet iron panel with enclosed doors together with knife switch and fuse mounted on panel, also operating switch with «off and on» position, to be mounted in the electrical circuit of the machine. The motor will drive the lathe by means of a Morse Chain, which is capable of delivering 1 1/4-H. P. with 37-tooth sprocket of a semi-nickel steel; mounted on upper spindle and a 19-tooth sprocket of hardened steel, mounted on the extended shaft of the motor and chain will run in an enclosed case which is oiltight. Lathe will be provided for screw cutting with thread dial attachment for cutting metric threads and U. S. Standard threads, with quick change gear box, providing ten changes of speed in the speed of the box which is multiplied three times through auxiliary feeds placed under the head stock, cutting threads from 4 to 40 per inch, including pipe threads. The spindle of lathe to run in the best phospher bronze bearings with ample oiling facilities. The mechanism will be of the standard design of the «Davis Screw Cutting Engine Lathe.»

The following shall also be supplied with lathe:

One face plate to suit swing of lathe.
Compound and steady rest.
One 8 1/2-in. four-jaw independent chuck, with reversible jaws, fitted to lathe spindle.
One 6-in. three-jaw Universal chuck, fitted to lathe spindle.
One 1/2-in. capacity, drill chuck, Horton and Morrow make, fitted to tail stock.
One drill pad, 6-in. diameter, fitted to tail stock.
One V center for drilling shafting.
All necessary wrenches.

The following spares to be supplied for motor:

One set carbon brushes.

One brush holder and three springs.

One set insulation for brush holder.

Necessary spare parts for starter.

The general design to be as per the blueprint submitted by the Fairbanks Company to the Motor Transport Corps in Washington for lathes to be installed on Machine Shop Trucks.

The following tool holders (to suit tool post) are to be supplied with each lathe:

One straight, one right hand offset, one left hand offset tool holders.

One right hand offset cutting off holder.

One boring tool.

All of the above holders are to be Armstrong or equal.

1 Air Compressor, Portable, 125 lbs. pressure, motor driven, 110 V. D. C.

1 Air Hammer to be used with above Air Compressor.

General Tools

1 Block, Single, Steel, 1-in., with bracket and safety link hook.

1 Block, Double, Steel, 1-in., with bracket and safety link hook.

1 Drill, hand, single speed with three-jaw chuck to hold straight shank drills up to 3/8-in. dia. Yankee 1540 or equal.

1 Emery wheel dresser with the two extra sets of cutters.

1 Forge, portable, hand-power blower, closed hood, height 32-in. size of pan 30-in. by 36-in., with water pan attached. Buffalo Forge Co. or equal.

1 Gear puller, Beach automatic or equal.

1 Hoist, differential, chain, smooth running, 1-ton capacity not less than 8-ft. single lift, Yale & Towne or equal.

1 Jack, 15-ton capacity, double action with 12 1/2-in. lift, 21 1/2-in. height. Simplex emergency No. 310 or equal.

1 Pump, air, hand, 2-cylinder, with hose and couplings, Globe or equal.

1 Press, arbor, stand or bench, weight 125 lbs., capacity 12-in. dia., 1 1/2-in. arbor. Atlas No. 3 or equal.

1 Press, tire, capacity not less than 110 tons. This may be standard M. T. C. tire press trailer or any standard commercial press which will meet the specifications for the former in regard to capacity, performance, quality of construction, but must be mounted on trailer when furnished for Mobile Park.

1 Rope, 1-in. manila, 125 ft.

1 Tank, compressed acetylene, 12-in. by 36-in. over all, 225 cu. ft. at 250 lbs. pressure, complete with valve and protecting cap, for welding.

2 Tanks, oxygene, 9 5/16-in. by 51-in. over all, tested to 3,000 lbs. pressure complete with valves and protecting caps, capacity 200 cu. ft. oxygen at 1,800 lbs. pressure, for welding.

2 Vises, 4-in. jaw, swivel base with removable steel faces if possible.

1 Vise, 4-in. jaw, combination pipe, swivel base.

1 Vise, Woodworker's.

Special Hand Tools

Drills, straight shank:
3 1/8-in.
3 3/16-in.
2 1/4-in.
2 5/16-in.
2 3/8-in.
1 7/16-in.
1 1/2-in.
1 9/16-in.
1 5/8-in.
1 11/16-in.

Drills, taper shank:
1 3/4-in.
1 13/16-in.
1 7/8-in.
1 15/16-in.
1 1-in.

Expansion Reamers:
1 1/2-in. to 5/8-in.
1 5/8-in to 3/4-in.
1 3/4-in. to 7/8-in.
1 7/8-in. to 1-in.
1 1-in. to 1 1/8-in.
1 1 1/8-in. to 1 1/4-in.
1 Set Straight Shank Drills, No. 60 to 0.
1 Set of Taper Reamers, No. 00, 0, 1, 2, 3, 4, 5.
1 Screw plate, consisting of SAE taps and dies with stocks and wrenches for same. Sizes 1/4-in., 5/16-in., 3/8-in., 7/16-in., 1/2-in., 9/16-in., 5/8-in., 11/16-in., 3/4-in., 7/8-in., 1-in.

The above drills, taps, dies and reamers to be in suitable containers.

Blacksmith Tools:
1 Sledge, Blacksmith, straight pein, 8 lb. with two handles.
1 Hammer, 3 lb., cross pein.
1 Fuller, Top, 3/8-in. with handle.
1 Anvil, 125 lbs.
1 Hardie to fit anvil.
1 Swage Block, 18-in. x 13-in. x 4 1/2-in.
2 Punches, round, 1/2-in. and 3/4-in.

Lathe Dogs:
4 Bent tail, clamp, Lathe Dogs, 1/2-in., 1-in., 1 5/8-in., 2 1/2-in.
1 Bolt Cutter, 5/8-in. capacity, 1 set extra jaws.
1 Bar, steel, pry, 2 1/2 ft.
1 Bar, crow, 25 lb.
2 Bars, crow, 12 lb.
1 Chain tool for 3/8-in. skid chain.
2 Clamps, Mechanics C, 3-in.
2 Clamps, Mechanics C, 6-in.
2 Clamps, Mechanics C, 10-in.
1 Can for oil, Fairbank's catalogue, figure 8661A or equal.
1 Ax, 4 lbs. with handle.
6 25-ft.—16 B. & S. W. P. Cords equipped with screw plug No. 903 chandelier hook and G. E. Catalogue No. 18471 deflector with wire guards.
6 25-ft.—16 B. & S. W. P. Cords equipped with Hubbel and brass shell pendant cap key socket with wire guard.

3 25-ft.—16 B. & S. W. P. Cords equipped with screw plug No. 903 and brass shell pendant cap keyless socket.
8 Receptacles, metal, 10 amperes, 250 volts, to be used for miscellaneous power. These receptacles are to be furnished in metal case with hinged cover, and holes for connecting conduit, for Mobile Service Parks.
3 Oilstones, Carborundum, coarse and fine, 6-in. x 2-in.
2 Gauges, air pressure for tire.
6 Lanterns, oil, and 12 wicks.
3 Sets of scrapers, carbon.
1 Shovel, forge.
1 Stencil, letter 4-in. (set)
1 Stencil, number 4-in. (set)
1 Wrench, Monkey, 24-in.
1 36-in. Extension Handle for monkeywrench.
4 Wrenches, Stillson, 8-in.
4 Wrenches, Stillson, 12-in.
2 Wrenches, Stillson, 18-in.
1 Wrench, Stillson, 24-in.
2 Valve Lifters, Packard type.
2 Valve Lifters, Chain type.
1 Set Socket Wrenches, packed in suitable work case, large Auto Cle or equal.

The large Auto Cle set consists of the following:
  1 Take-down reversible ratchet handle, nickle-plated.
  1 Swivel or Universal Joint, which permits using the wrench at any angle.
  1 9 1/2-in. Extension Bar.
  1 1 3/4-in. Extension Bar.
  2 Sizes of Screwdriver Bits.
  31 Sizes of Mottled Case-hardened Pressed Steel Sockets.
  Sizes of sockets furnished:

Hexagon:
5/16, 11/32, 3/8, 13/32, 7/16, 15/32, 1/2, 17/32, 9/16, 19/32, 5/8, 21/32, 11/16, 23/32, 3/4, 25/32, 13/16, 27/32, 7/8, 29/32, 15/16, 31/32, 1, 1 1/32, 1 5/32, 1 9/32 inches.
Square:
13/32, 17/32, 21/32 inch.

Equipment for Immobile Service Park

447. The equipment for Immobile Service Park is to be installed in a suitable building, while the equipment for Mobile Service Park is to be installed on a truck. For this reason the specifications given herein, covering machine tools for Immobile Service Park differ from Mobile Service Park in respect that they are belt driven from line shaft, as individual motor driven machines are difficult to procure and are needed for Mobile Service Parks.

448. The power equipment is also changed, as electric power is to be obtained from some outside source wherever possible. Where electric power is available from some outside source, the blank is to be filled in, giving complete specifications of motor to be furnished. If electric power cannot be obtained from outside source, it will be necessary to furnish 7 1/2-K.W. Gasoline Electric Set, switchboard and 5-H.P. Motor in accordance with attached specifications.

449. Specifications are made of as general a nature as possible to facilitate the procurement of equipment which will accomplish

the work. When any of the equipment called for is not available, furnish nearest substitute.

450. The following Individual Tool Kits are issued to the personnel:

9	Chassis Repair Mechanic	Kit No. 1
1	Blacksmith	Kit No. 2
3	Motorcycle Mechanic	Kit No. 3
2	Carpenter and Wheelwright	Kit No. 4
1	Welder	Kit No. 5
1	Motor Mechanic	Kit No. 6
1	Machinist	Kit No. 7
1	Electrical and Carburetor Mechanic	Kit No. 8
1	Radiator and Sheet Metal Mechanic	Kit No. 9
1	Trimmer	Kit No. 10
1	Tire Press Mechanic	Kit No. 11
1	Painter	Kit No. 12
1	Vulcanizer	Kit No. 13
1	Battery Repair Mechanic	Kit No. 14

The following increment of equipment, when added to the above listed Individual Tool Kits, forms one (1) complete equipment for Immobile Service Parks:

Power Equipment

Specifications of Electric Motor

H.P..............Volts............A.C. or D.C..........Winding

Number of Phases........Number of Cycles........Speed........

The above is to be furnished with sliding base, standard pulley and starting switch.

The above motor is to be furnished whenever power can be obtained from some outside power source, and is to be used for driving the main line shafting. If power cannot be obtained and specifications of above motor are not given, it will be necessary to furnish the following gasoline electric set, switchboard, and motor:

1 Power Plant, Gasoline-Electric, 7 1/2-K.W., 110-Volt, D.C. To consist of a direct current, compound wound electric generator, direct connected to a four-cylinder, four-cycle, water-cooled gasoline engine. This unit to be complete with all accessories and to have a radiator of ample capacity with fan driven from engine, mounted in unit power plant, also to be supplied with 20-gallon tank of best construction mounted with the unit or supplied with wall brackets and 12 feet of seamless copper tubing and fittings for connection from tank to carburetor.

Set of Spare Parts for power plant engine to consist of:

4 Spark Plugs.
2 Valves, exhaust.
2 Valves, springs.
2 Spring Governors.
4 Wrist Pins.
12 Piston Rings, oversize.
2 Cylinder Head Gaskets, if motor has detachable heads.
4 Pair connecting rod bearings.
4 Pistons—Oversize.
2 Camshaft Bearings.
2 Sets of Generator Brushes.

1 Set of Bearing Linings for Generator.
2 Fan Belts.
1 Complete set Crank Shaft Bearings.
3 Sets of Rubber Hose Connections.

1 Switchboard to be constructed of best quality, well seasoned hardwood amply reinforced to prevent warping and provided with brackets for wall mounting. To be equipped with the following:

1 75-ampere, 110-volt, D. P. S. T.; switchboard type knife switch with fuse block and ten 75-ampere fuses.

1 Switchboard type ammeter, D. C., scale 0 to 100 amperes, Weston make or equal.

1 Switchboard type D. C. voltmeter, scale 0 to 150 volts, Weston make or equal.

1 Rheostat for field of generator, with extended handle for operating from front of switchboard.

3 30-ampere, D. P. S. T. switchboard type, knife switches with 3-D. P. fuse blocks and 25 30-ampere fuses. Necessary connections, nuts, terminals, etc.

1 5-H.P., any speed, 110-volt, shunt or compound wound, D. C. Motor, with pulley, sliding base and hand starting rheostat.

Machine Tool Equipment

1 Electric Portable Drill to take up to 5/8-in. drills, fitted with 5/8-in. capacity three-jaw Universal drill chuck. Motor to be wound for 110 volts, D.C. Each drill to have 20-ft. lead of best grade heavy braid flexible cable with attachment plug.

1 14-in. or 16-in. Column Sensitive Drill Press, complete with chuck of capacity up to 3/4-in. St. Shank Drills, fitted to spindle. This machine is to be supplied with line shaft pulley bored for a 2-in. line shafting, and of a diameter to give correct tight and loose drill pulley speed for a line shaft speed of 150 R. P. M., 40-ft. of proper width belting is also to be furnished.

1 Grinder, Column, Dry Emery, for wheels 10-in. by 1 1/2-in., to have self-lubricating bearings and equipped with rests and safety wheel guards. Two fine and two medium grade wheels are to be supplied. This grinder is to be furnished with line shaft pulley bored for 2-in. line shafting, and of a diameter to give correct wheel speed for a line shaft speed of 150-R.P.M. 40-ft. of proper width belting is also to be furnished.

1 Lathe, Engine, 12-in. or 14-in. swing, belt-driven, double-back geared, quick-change gears, equipped with necessary counter shafting, compound tool rest, change gears for cutting U. S. Standard and Metric threads, 3-jaw steady rest and necessary wrenches.

Extra Attachments to be furnished with lathe:
1 8-in. Three-jaw Universal chuck fitted to spindle.
1 10-in. Four-jaw Independent chuck fitted to spindle.
1 Drill chuck with auxiliary screw, 1-in. capacity, fitted to tail stock spindle.
1 Full size face plate.
2 Sets of lathe centers.
1 Set of tool holders. Armstrong or equal. To consist of 1 straight, 1 right-hand and one left-hand turning holder; 1 combination boring tool; 1 right-hand off-set cutting off holders.

1 Line shaft pulley, bored for 2-in. line shafting, and of a diameter to give correct lathe countershaft speed for a line shaft speed of 150 R. P. M. 60-ft. proper width, best quality belting to be supplied with lathe.

1 Grinder Tool Post, Electric, 110-Volt, D.C., to be supplied with internal and external grinding attachment; 7 grinding wheels, internal and external; cross feed lever, 10-ft. cord, 1 switch and 1 attachment plug. Dunmore class A or equal.

30 Ft. Line Shafting, 2-in. diameter, with necessary couplings.

5 Hangers for Line Shafting.

2 Collars for ends of Line Shafting.

General Tools

Same as listed under Mobile Service Park.

Special Hand Tools

Same as listed under Mobile Service Park.

Equipment for Repair Section

451. The following Individual Tool Kits are issued to the personnel:

22	Chassis Repair Mechanic	Kit No. 1
2	Blacksmith	Kit No. 2
6	Motorcycle Mechanic	Kit No. 3
3	Carpenter and Wheelwright	Kit No. 4
1	Welder	Kit No. 5
4	Motor Mechanic	Kit No. 6
2	Machinist	Kit No. 7
2	Electrical and Carburetor Mechanic	Kit No. 8
2	Radiator and Sheet Metal Mechanic	Kit No. 9
1	Trimmer	Kit No. 10
2	Tire Press Mechanic	Kit No. 11
2	Painter	Kit No. 12
1	Vulcanizer	Kit No. 13
1	Battery Repair Mechanic	Kit No. 14

The increment of equipment added to the above Individual Tool Kits to form one (1) complete equipment for a Repair Section is the same as the increment listed under Equipment for an Immobile Service Park.

EQUIPMENT FOR OVERHAUL PARKS

NOTE

452. Specifications are made of a general nature with few limitations as to details, to facilitate the procurement of machines which will accomplish the work to be done.

453. Belt-driven types of machines are to be supplied except where otherwise specified. All necessary countershafts, pulleys, belting, and hangers are to be supplied with each machine. Line-Shaft Pulleys are to be bored for 2-in. line-shafting with a speed of 150 R.P.M.

454. If the occasion should arise where the specified machines or any other equipment cannot be provided, *substitutes will be accepted.*

455. The following Individual Tool Kits are issued to the personnel:

1/4 Size	*1/2 Size*	*Full Size*		
88	176	352	Chassis Repair Mechanic	Kit No. 1
8	16	32	Blacksmith	Kit No. 2
24	48	96	Motorcycle Mechanic	Kit No. 3
12	24	48	Carpenter and Wheelwright	Kit No. 4
4	8	16	Welder	Kit No. 5
16	32	64	Motor Mechanic	Kit No. 6
8	16	32	Machinist	Kit No. 7
8	16	32	Electrical and Carburetor Mechanic	Kit No. 8
8	16	32	Radiator and Sheet Metal Mechanic	Kit No. 9
4	8	16	Trimmer	Kit No. 10
8	16	32	Tire Press Mechanic	Kit No. 11
8	16	32	Painter	Kit No. 12
4	8	16	Vulcanizer	Kit No. 13
4	8	16	Battery Repair Mechanic	Kit No. 14

The following increments of equipment, when added to the above Individual Tool Kits, form complete equipments for One-Quarter (1/4), One-Half (1/2), and Full Size Overhaul Parks:

Power Equipment

Quantity			Description
1/4 Size	*1/2 Size*	*Full Size*	
1	2	3	Power plant, gasoline, General Electric, 25-K. W., 110-volt, D. C. To be standard G. E. unit as supplied to the Engineering Corps, complete with switchboard.
1	...	...	Power plant, gasoline-electric, 10 K. W., 110-volt, D. C. To consist of a direct current, compound wound, electric generator, direct connected to a gasoline engine, four-cylinder, four-cycle, water cooled. This unit to be all complete with all accessories and to have a radiator of ample capacity with fan driven from engine, mounted on unit power plant, also to be supplied with tank of best quality mounted with unit or supplied with wall brackets and 12 feet of seamless copper tubing and fittings for connection to carburetor. Spare parts for set: 4 Spark plugs 2 Valves, exhaust 2 Valve springs 2 Springs, governor 4 Wrist pins 12 Piston rings—oversize, .005-in. 2 Cylinder head gaskets, if necessary 4 Pair of connecting rod bearings 4 Pistons—oversize, .005-in. 2 Camshaft bushings 2 Sets of generator brushes 1 Set of bearing liners for generator 2 Fan belts 1 Complete set of crankshaft bearings 3 Sets of rubber hose, water connections.
1	...	...	Battery charging switchboard to be constructed of best quality, well-seasoned hardwood amply rein-

Quantity 1/4 Size	 1/2 Size	 Full Size	Description
			forced to prevent warping and equipped with the following: 1 Switchboard type, 60-ampere, D. P. S. T. knife switch, with D. P. fuse block, and ten 60-ampere fuses. 4 Switchboard type, 30-ampere, S. P. D. T. knife switches. 1 Switchboard type, D. C. ammeter, scale 0 to 30 amperes, Weston. 1 Switchboard type, D. C. voltmeter, scale 0 to 150 volts 1 Reverse current release coil, 110-volt, D. C., 60 amperes (to prevent batteries discharging into line). 4 Adjustable rheostats, capacity 2 to 20 amperes, resistance 15 ohms, for mounting back of switchboard, with extension handles approximately 20 inches in length, so rheostat can be operated from the front of board. 1 Switchboard type, 30-ampere, D. P. S. T. knife switch, 6 20-ampere double pole fuse blocks. 30 20-ampere fuses to be used with above blocks. Supply all necessary wire, connections, nuts, bolts, terminals, porcelain cleats, etc.
...	1	...	Battery charging switchboard, to be constructed of best quality well-seasoned hardwood, amply reinforced to prevent warping, and equipped with the following: 1 Switchboard type, 100-ampere, D. P. S. T. knife switch, with D. P. fuse block and ten 100-ampere fuses. 6 Switchboard type, 30-ampere, S. P. D. T. knife switches. 1 Switchboard type, D. C. ammeter, scale 0 to 30 amperes, Weston. 1 Switchboard type, D. C. voltmeter, scale 0 to 150 volts, Weston. 1 Reverse current release coil, 110-volt, D. C., 100-ampere (to prevent batteries discharging into line). 6 Adjustable rheostats, capacity 2 to 20-ampere, resistance 15 ohms, for mounting back of switchboard, with extension handles approximately 20-in. in length, so rheostat can be operated from front of switchboard. 1 Switchboard type, 30-ampere, D. P. S. T. knife switch, 8 20-ampere, double pole fuse blocks. 30 20-ampere fuses to be used with above blocks. Necessary wire, connections, nuts, bolts, terminals, porcelain cleats, etc.
...	...	1	Battery charging switchboard, to be constructed of best quality well-seasoned hardwood, amply re-

Quantity 1/4 Size	Quantity 1/2 Size	Quantity Full Size	Description
			inforced to prevent warping, and equipped with the following: 1 Switchboard type, 100-ampere, D. P. S. T. knife switch, with D. P. fuse block and ten 100-ampere fuses. 10 Switchboard type, 30-ampere, S. P. D. T. knife switches. 1 Switchboard type, D. C. ammeter, scale 0 to 30 amperes, Weston. 1 Switchboard type, D. C. voltmeter, scale 0 to 150 volts, Weston. 1 Reverse current release coil, 110-volt, D. C., 100-ampere (to prevent batteries discharging into line). 10 Adjustable rheostats, capacity 2 to 20-ampere, resistance 15 ohms, for mounting back of switchboard, with extension handles approximately 20-in. in length, so rheostat can be operated from front of switchboard. 1 Switchboard type, 30-ampere, D. P. S. T. knife switch. 12 20-ampere double pole fuse blocks. 50 20-ampere fuses to be used with above blocks. Necessary wire, connections, nuts, bolts, terminals, porcelain cleats, etc.

Machine Tool Equipment

Quantity 1/4 Size	Quantity 1/2 Size	Quantity Full Size	Description
4	6	12	Electric portable drills, to take up to 5/8-in. straight shank drills, fitted with 5/8-in. capacity, three-jaw, universal drill chuck, motor to be wound for 110 volts, D. C. Each drill to have 20 feet lead of best grade, heavy braid, flexible cable with attachment plug.
3	6	12	Column sensitive drill presses, 14-in. or 16-in., complete with chuck, of capacity up to 3/4-in. straight shank drills, fitted to spindle.
1	2	4	Column drill press, 20-in., with back gears, power and hand lever feed, complete with universal drill chuck of capacity up to 1-in. fitted to spindle, and one set of taper shank drill sleeves to fit spindle taper.
1	...	...	Column drill, 20-in., same as above, only equipped with milling attachment and necessary cutters for cutting key ways, etc.
...	...	1	Drill press, 24-in., with back gears, power and wheel feed, spindle to have No. 4 Morse taper hole. Furnished complete with universal drill chuck and one set of taper shank drill sleeves to fit spindle.
2	4	6	Grinders, column, dry, emery, for wheels 10-in. by 1 1/2-in., with self-lubricating bearings and equipped with rests and safety guards. Two fine and two medium grade wheels are to be supplied with each machine.

Quantity			Description
1/4 Size	*1/2 Size*	*Full Size*	
3	6	12	Grinders, bench, for wheels 8-in. by 1-in., with self-lubricating bearings and equipped with rests and safety wheel guards, motor driven, 110 volts, D. C. Two fine and two medium grade wheels are to be furnished with each machine.
1	2	3	Grinder, drill, capacity 3/32-in. to 1 1/4-in. drills, New Yankee, style «JD.» Two fine and two medium grade wheels are to be furnished with each machine.
1	3	4	Grinder, tool post, electric, 110 volts, D. C. Any best quality standard machine is suitable. Machine is to be supplied with 20-foot, heavy braid, flexible cord, lead, with attachment plug and an assortment of six grinding wheels.
1	2	3	Grinder, wet, 20-in. by 2-in., power driven.
...	...	1	Cylinder grinder, for grinding cylinders 2 1/2-in. to 6-in. diameter. To be furnished with complete equipment and two 2-in. diameter, two 2 1/2-in. diameter, and two 3-in. diameter emery wheels, motor driven preferred, 110 volts, D. C.
1	1	1	Universal grinding machine, for tool work, similar to No. 1 machine manufactured by the Landis Tool Co. This machine to be furnished complete with the following grinding wheels as given in the Landis Tool Co.'s catalogue: 2 Shape No. 50, size 10 x 5/16-in. 2 Shape No. 51, size 10 x 3/8-in. 2 Shape No. 52, size 10 x 1/2-in. 2 Shape No. 53, size 10 x 5/8-in. 2 Shape No. 54, size 10 x 3/8-in. (Convex)
...	...	1	Grinder, crank shaft, self contained, Landis, 16-in. by 68-in, with the following equipment: 2 Grinding wheels, 26-in. diameter, 1 1/2-in. and 2 1/4-in. face. 2 Grinding wheel centers. 1 Plain wheel trueing device without diamond. 1 Radial trueing device with diamond. 3 Work rests, pump and tank, water guards, and rods, set of wrenches. 1 Extra equipment: Grinding wheel center.
1	1	2	Universal woodworker, consisting of five principal parts; 32-in. band saw, 12-in. jointer, shaper, saw-table and bore; to be as per 109 Crescent Machine Co., with all regular equipment. Special equipment to be supplied with this machine as follows: 1 Ripping-fence for band saw. 1 Resaw gauge. 1 Round safety head for jointer. 1 Panel raiser. 1 Saw guard for saw. 1 Dade head, No. 4. 1 Groover head, No. 33. 1 Knife grinder. 1 Disc grinder.

Quantity *1/4 Size*	 *1/2 Size*	 *Full Size*	**Description**
			3 Saw blades, 1/4-in., fitted and brazed for band saw.
			3 Saw blades, 1/2-in., fitted and brazed for band saw.
			3 Saw blades, 5/8-in., fitted and brazed for band saw.
			3 Saw blades, 3/4-in., fitted and brazed for band saw.
			2 Extra sets of jointer knives.
			2 Circular saws.
			If the above machine or equivalent Universal woodworker with entire equipment necessary to cover range of work for which machine is capable, cannot be supplied, the following machines may be substituted for same:
			1 Jointer, to be of any standard make, best quality, with at least a 14-in. cylindrical head.
			1 Saw, band, 36-in., with complete equipment as to range of saws.
			Saws: 3 1/4-in., 3 1/2-in., and 3 3/4-in. blades.
			1 Saw, circular, 14-in. or 16-in. Universal. Any standard make with standard equipment, complete saws: 2 rip saws, 2 cross-cut saws.
1	2	4	Lathe, 10-in. or 12-in. swing, 5-ft. or 6-ft. bed, mounted on floor legs, with tool post, gears for cutting U. S. Std. threads, and all regular equipment.
			Extra equipment for above lathe:
			1 8-in. four-jaw, Independent chuck for mounting on spindle.
			1 6-in. three-jaw, Universal chuck for mounting on spindle.
			1 Full size face plate.
			1 Drill chuck, 1/2-in. capacity, Universal three-jaw type, mounted on arbor to fit tail stock spindle.
			1 Set of engine lathe centers, 60 degrees.
			1 Set of lathe tool holders to consist of: One straight, one right-hand and one left-hand turning holders, one right-hand cutting-off holder, one combination boring tool, Armstrong.
2	4	4	Lathes, engine, 14-in. or 16-in. swing by 6-ft. or 8-ft. bed, double back geared, quick change gears, equipped with compound tool rest, three-jaw steady rest, and change gears for cutting U. S. Std. threads or metric threads.
			Extra equipment to be supplied:
			1 10-in. three-jaw, Universal chuck, fitted to spindle.
			1 12-in. four-jaw, Independent chuck fitted to spindle.
			1 Drill chuck with auxiliary screw, 1-in. capacity, fitted to tail stock spindle.
			1 Full size face plate.
			1 Set of lathe centers, 60-degree.

Quantity			Description
1/4 Size	*1/2 Size*	*Full Size*	
			1 Set of tool holders, Armstrong, to consist of one straight, one right-hand and one left-hand, combination boring tool.
1	2	4	Lathe, 18-in. or 20-in. swing, 8-ft. or 10-ft. bed, double back geared, quick change gears, compound tool rest, three-jaw steady rest, and change gears for cutting U. S. Std. and metric threads. Extra equipment to be supplied: 1 12-in. or 14-in. three-jaw, Universal chuck, fitted to spindle. 1 16-in. four-jaw Independent chuck, fitted to spindle. 1 Drill chuck, 1-in. capacity, fitted to tail spindle. 1 Full size face plate 1 Set of lathe centers, 60-degree. 1 Set of tool holders, to consist of: One right-hand, one left-hand and one straight turning holders, one right-hand cutting-off holder, one combination boring tool.
...	...	1	Lathe, engine, heavy duty, 24-in. swing by 10-ft. bed. Double back geared, quick change gears, compound tool rest, steady rest, change gears for cutting U. S. Std. threads and metric threads. Extra attachments for lathe: 1 14-in. Universal, three-jaw, chuck, fitted to spindle. 1 18-in. Independent, four-jaw chuck, fitted to spindle. 1 Drill chuck, 1 1/2-in. capacity, fitted, tail stock spindle. 1 Full size face plate, fitted to spindle. 1 Set of lathe centers. 1 Set of tool holders as follows: One right-hand, one left-hand and one straight turning holder, one right-hand cutting-off holder and one combination boring tool.
23	46	69	Lathe dogs as follows: Three each, 3/4-in., 1-in., 1 1/2-in., 2-in., 2 1/2-in., 3-in., 4-in., one each, 5-in., 6-in.
1	2	3	Shaper, crank, 16-in., heavy duty, back geared, maximum stroke, 16 1/2-in., horizontal travel of table, 20-in.; vertical travel of table, 14 1/2-in. Extra equipment to be supplied: 1 Double screw vise, 2-in. by 10-in. jaws, opening 8 1/4-in. 1 Key seating attachment. 1 Set of tool holders, Armstrong. 1 Set of solid shaper tools.
2	4	6	Presses, arbor, stand or bench, Atlas No. 3, capacity 12-in. diameter, 1 1/2-in. arbors.
1	2	4	Press, arbor, stand, Atlas No. 4, capacity 19-in. diameter, 3-in. arbors.

Quantity			**Description**
1/4 Size	*1/2 Size*	*Full Size*	
1	1	1	Press, bench, with centers for straightening purposes.
...	...	1	Press, arbor, stand, Atlas No. 5, capacity 26-in. diameter, 4-in. arbors.
1	2	2	Punch, hand, capacity for 1/2-in. hole, 1/4-in. stock; to be supplied complete with dies for range of 1/8-in. to 1/2-in. diameter holes.
...	...	1	Punch, power, double, punch and shear, 18-in. throat, capacity for punching 3/4-in. hole in 1/2-in. steel stock, will shear 1/2-in. plates, 1 1/8-in. round bars, 4-in. by 1/2-in. flat stock, 2 1/2-in. by 2 1/2-in. by 1/4-in. angle bars. Supplied with regular punching attachment, regular plate shearing attachment, regular bar shearing attachment, regular angle shearing attachment. Safety guards and all regular equipment. Extra equipment: 2 Complete sets punches and dies, 1/4-in. to 3/4-in., inclusive by 16ths. 1 Set square punches and dies, 1/4-in. to 3-4-in., inclusive by 16ths. 1 Extra pair plate shears. 1 Extra pair bar shears.
1	2	2	Shear, hand capacity for cutting flat stock up to 1/4-in. and round stock up to 5/8-in. To be supplied with one extra set of shear blades.
1	2	2	Sewing machine, medium duty, motor driven, 110 volts, D. C., suitable for work on 12-oz. canvas and top material. Compound feed type, Singer No. 21-W-180.
1	1	2	Sewing machine, heavy duty, motor driven, 110 volts, D. C., suitable for work on 20-oz. canvas and top material. Darning type, hand feed, Singer No. 45 3/4-K-1.
...	...	2	Buffing machines, suitable for bench mounting double ended. Three extra buffing wheels of canvas and three of wire are to be furnished. Individual motor driven preferred, 110-volt, D. C.
..	1	1	Hammer, power, 300 lbs., mechanically operated, complete with control levers, anvils, cushions, etc.
...	...	1	Centering machine, for making centers in stock up to 4-in. in diameter, stationary, sensitive, and with elevating table, complete with chucks and accessories.
1	2	2	Universal milling machine, size No. 3, complete with all regular equipment, including Universal dividing head, three-jaw Universal chuck and tail center, vertical milling attachment, slotting attachment, rack cutting attachment with indexing attachment, and spiral milling attachment. Also full set of cutters for the above attachments.
1	2	3	Hack saw, power, capacity up to 6-in. stock, positive, automatic, variable feed. Positive horizontal stroke insuring square work Movable work vise and automatic stop.

Quantity			
1/4 Size	*1/2 Size*	*Full Size*	**Description**
1	1	2	Squaring shears, tinner's, with hold down attachment, 37-in.
1	1	2	Burring machine, small hand, with extra upper face and standard.
1	1	2	Cornice brake, hand, 37 1/2-in.
1	1	2	Crimper, tinner's hand, with straight crimping and beading rolls, with standard.

General Tools

4	8	16	Anvils, 200 lbs., wrought iron base with welded steel face, round taper nose.
1	2	2	Ammeter, portable, in suitable case, scale 0 to 75 amperes, D. C.
1	1	2	Air Compressor, garage type, portable, for 125 pounds pressure, 110 volts, D. C., motor driven, mounted with air receiver on an industrial truck. Capacity to be approximately 25 cubic feet per minute at normal speed. Air receiver to be fitted with gauge and blow-off valve. Outfit to be supplied with 39 feet of best grade air hose, motor-starting rheostat mounted with unit, and is to have 30 feet extension feed lead of best grade, extra heavy braid flexible cable with attachment plug.
1	2	4	Air hammer, hand, for riveting. To be used with the above air compressor.
2	4	6	Cranes, portable, of any standard commercial make, 1,500-pound capacity, suitable for lifting motors from chassis.
2	4	6	Extinguisher, fire, large, fire fighting apparatus, chemical type, mounted on single axle and two wheels, capable of throwing a 3/8-in. stream 25 feet for a period of fifteen minutes. Twenty-five feet of hose.
40	60	80	Extinguishers, fire, hand.
2	4	6	Forges, portable, hand power blowers, closed hood, 32-in. height, size of pan 30-in. by 36-in., with water pan attached.
2	4	8	Forges, stationary, with electric blowers, speed control rheostat, closed hood, 30-in. by 40-in. pan, water pan, etc.
2	4	8	Jacks, 15-ton capacity, Simplex No. 310.
1	1	1	Tire press, capacity not less than 110 tons. This may be a standard M. T. C. tire press trailer or any standard commercial press which will meet the specifications of the former in regard to capacity, performance, quality of construction, but need not be mounted on trailer.
2	4	8	Chain pipe tongs, 4-in. or 6-in. capacity. Any best quality standard commercial make.
2	4	8	Chain tool for 3/8-in. skid chains.
6	12	18	Beach Automatic gear pullers, complete, with one extra set of jaws.
10	20	40	Trucks, industrial, capacity 2,000 pounds, four-wheel, platform type, to be drawn by tongue handle

Quantity			Description
1/4 Size	*1/2 Size*	*Full Size*	
			fifth wheel steer. Platform to be 36-in. by 60-in. with a height not less than 19-in. Truck wheel not to be less than 14-in. diameter, and have a rim width of at least 3-in. Axles, braces and tongue handle are to be steel.
1	2	4	Vulcanizing outfit, large, complete, Lowell or Shaler, for vulcanizing inner tubes.
25	50	100	Vises, machinist's, 6-in. jaw, to be constructed of semi-steel with tool steel jaw faces.
4	8	16	Vises, blacksmith's, 6-in. jaw, to be constructed of wrought steel with tool steel jaw faces.
2	4	6	Vises, combination pipe, capacity up to 3-in. pipe. Any best quality commercial make.
4	8	16	Vises, woodworker's.
2	4	6	Swage blocks, blacksmith's, 13-in. x 18-in. x 4-in.
2	4	8	Welding outfits, oxy-acetylene to include cutting torch, oxygen regulator for same, with gauge, 25 feet of hose for regulator; all packed in suitable container. Davis Bournville.
4	8	16	Gas tanks, oxygen, capacity 200 cubic feet.
2	4	8	Gas tanks, acetylene, capacity 200 cubic feet.
20	40	80	Trouble lamps, complete for 110-volt line, to include key socket with handle and guard, 25 feet of flexible lamp cord and attachment plug.
2	4	6	Post builders, for type STR-4 Willard battery, with two positive posts and two negative posts, upper halves of same.
2	4	6	Post builders, standard size, for type S. L. 26 Willard Battery.
1	1	2	Gas plate, two-burner.
1	1	2	Voltmeter, low reading, for battery charging, scale 0 to 2.8 volts positive, and 0 to .2 volts negative, with terminal leads and two prods with cadmium attachments.
1	2	2	Voltmeter, portable, in suitable case, 0 to 15 volts, and 0 to 150 volts, D. C.
1	1	2	Lead burning torch, with three tips of varying sizes, copper nozzle, 6-in. long over all, right angle bend, with 1-in. end.
1	1	2	Special oxygen regulating valve with gauges.
1	1	2	Acetylene regulating valve with gauge.
1	1	2	Bench block with needle valve.
4	8	16	Pieces of hose for connecting regulator to bench block, 10-ft.
4	8	16	Pieces of hose for connecting block to torch, 5-ft. each.

Special Hand Tools

These additional tools are to be furnished:

6	12	18	Ax, with handle.
4	8	18	Bar, crow, 12-lb.
4	8	18	Bar, crow, 25-lb.
12	24	36	Bar, pry, 2 1/2-ft.
8	20	40	Bits, wood, 5/16-in.

Quantity			Description
1/4 Size	*1/2 Size*	*Full Size*	
8	20	40	Bits, wood, 7/16-in.
8	16	32	Bits, wood, expansion, 1/2-in. to 1-in.
8	16	32	Bits, wood, expansion, 1/2-in. to 1 3/4-in.
2	4	6	Bowl, for melting resin, 4-in.
2	4	6	Bowl, for melting solder, 6-in.
1	3	5	Box, mitre, Stanley, No. 358.
24	30	40	Brushes, for car washing.
75	100	150	Brushes, for engine cleaning.
75	200	400	Chisels, Cape, 1/8-in. blade.
8	12	18	Chisels, carpenter's, jointer, 1/4-in. by 1/4-in.
8	12	18	Chisels, carpenter's, jointer, 1/2-in. by 1/2-in.
50	150	300	Chisels, diamond point, 1/2-in.
8	20	40	Clamp, mechanic's, «C,» 3-in.
8	20	40	Clamp, mechanic's, «C,» 6-in.
10	20	40	Clamp, mechanic's, «C,» 10-in.
8	12	16	Clamp, screw-head, extension, 6-ft.
8	12	16	Clamp, wood, small, 6-in.
8	12	16	Clamp, wood, large, 12-in.
8	16	32	Countersinks, carpenter's, square shank, 5/8-in.
6	24	32	Countersinks and drill, combined, No. 9, 1/8-in.
6	24	32	Countersinks and drill, combined, No. 10, 5/32-in.
6	24	32	Countersinks and drill, combined, No. 11, 3/16-in.
1	2	4	Crock, stone, with cover, 10-gal. capacity.
4	6	18	Cutter, bolt, 5/8-in.
4	6	12	Cutter, bolt, 5/16-in.
2	4	6	Cutter, glass, circular.
2	4	6	Cutter, glass, straight.
1	2	3	Cutter, pipe, 3-in.
1	3	4	Dies, alphabet, 1/4-in. set.
1	3	4	Dies, numbers, 1/4-in. set.
2	4	6	Die stock for metric taps and dies to 12 mm.
2	4	6	Die stocks for pipe threads: 1/8-in., 1/4-in., 3/8-in., 1/2-in.
4	6	8	Dies, 1/8-in.—40.
4	6	8	Dies, No. 8—32.
4	6	8	Dies, No. 10—32.
4	6	8	Dies, No. 10—24.
4	6	8	Dies, 3/16-in.—32.
2	4	6	Dies, pipe thread, 1/8-in.
2	4	6	Dies, pipe thread, 1/4-in.
2	4	6	Dies, pipe thread, 3/8-in.
2	4	6	Dies, pipe thread, 1/2-in.
2	4	6	Dies, pipe thread, 3/4-in.
2	4	6	Dies, pipe thread, 1-in.
1	2	4	Dies, pipe thread, 1 1/4-in.
2	4	6	Dies, metric, set 6 mm. to 12 mm.
2	6	12	Drills, small hand.
2	4	8	Drills, hand ratchet, capacity up to 1-in. drills.
6	12	24	Drills, straight shank, in sets, No. 60 to No. 0.
24	50	100	Drills, straight shank, 1/8-in.
24	50	75	Drills, straight shank, 5/32-in.
18	50	100	Drills, straight shank, 3/16-in.
18	40	50	Drills, straight shank, 3/32-in.
18	40	60	Drills, straight shank, 7/32-in.

Quantity			Description
1/4 Size	*1/2 Size*	*Full Size*	
24	50	75	Drills, straight shank, 1/4-in.
18	50	75	Drills, straight shank, 9/32-in.
18	50	75	Drills, straight shank, 5/16-in.
10	30	60	Drills, straight shank, 11/32-in.
10	50	75	Drills, straight shank, 3/8-in.
10	30	60	Drills, straight shank, 13/32-in.
8	25	50	Drills, straight shank, 7/16-in.
6	25	50	Drills, straight shank, 15/32-in.
12	50	75	Drills, straight shank, 1/2-in.
6	12	24	Drills, straight shank, 17/32-in.
5	10	20	Drills, straight shank, 9/16-in.
6	12	24	Drills, straight shank, 19/32-in.
6	12	24	Drills, straight shank, 5/8-in.
3	6	12	Drills, straight shank, 21/32-in.
4	8	16	Drills, straight shank, 11/16-in.
4	8	16	Drills, straight shank, 23/32-in.
5	10	20	Drills, taper shank, 3/4-in.
4	8	12	Drills, taper shank, 25/32-in.
4	8	12	Drills, taper shank, 13/16-in.
3	8	12	Drills, taper shank, 7/8-in.
3	6	12	Drills, taper shank, 15/16-in.
2	6	12	Drills, taper shank, 1-in.
2	5	10	Dresser, emery wheel.
20	40	80	Files, mill, second cut, 12-in.
20	40	80	Files, mill, second cut, 8-in.
20	40	80	Files, square, bastard, 6-in.
10	30	60	Files, three square, taper, 6-in.
4	8	16	Flatter, square, 2-in., with handle.
4	8	16	Fuller, bottom, 3/4-in.
4	8	16	Fuller, bottom, 3/8-in.
4	8	16	Fuller, top, 3/8-in., with handle.
4	6	8	Funnel, acid, lead or glass.
2	4	8	Gauge, tire.
2	4	6	Gauge, thread, metric.
2	4	6	Gauge, steel, wire, U. S. Std.
2	4	6	Gauge, drill, 1/16-in. to 1/2-in., by 64ths.
2	2	4	Gauge, drill, No. 60 to No. 0.
2	8	12	Gauge, surface, 9-in. spindle.
2	8	12	Gauge, depth, 6-in.
12	15	20	Glasses, clear, for grinding.
6	12	24	Guns, grease.
6	12	24	Guns, oil.
4	8	16	Hammer, cross pein, 3-lb.
4	8	16	Hammer, blacksmith's sledge, 8-lb.
2	8	16	Hammer, blacksmith's sledge, 12-lb.
24	50	75	Hammer, light lead, 1 1/2-lb.
4	8	16	Hardie, to fit anvil, 2-in.
1	3	4	Indicator, speed.
1	2	4	Indicator, universal dial, test.
1	2	2	Kettle, for battery sealing compound, 10-qt.
4	4	6	Ladle, 3-in. for solder.
1	2	3	Ladle, 3-in. for battery sealing compound.
2	4	6	Level, 12-in. carpenter.
6	6	12	Lifters, valve, Packard.

Quantity			
1/4 Size	*1/2 Size*	*Full Size*	**Description**
6	15	30	Lifters, valve, chain.
2	4	6	Micrometers, 2-in. to 3-in., in case.
2	4	6	Micrometers, 3-in. to 4-in., in case.
2	4	6	Micrometers, 4-in. to 5-in., in case.
6 doz.	8	12	Needles, machine sewing, No. 6, for cloth.
6 doz.	8	12	Needles, machine sewing, No. 7, for cloth.
6 doz.	8	12	Needles, machine sewing, No. 6, for leather.
12	24	36	Pencils, carpenters.
8	10	16	Plane, rabbet, No. 78, Stanley.
2	10	20	Plate, surface, 12-in. by 18-in.
2	4	6	Pot, glue.
4	8	12	Protractor, carpenter's bevel.
1	2	4	Pump, gasoline, Bowser, hand.
2	6	8	Pump, for testing purposes.
6	8	16	Punch, blacksmith's, round taper, with handle, 1/4-in., 3/8-in., 1/2-in.
6	8	16	Punch, blacksmith's square taper, with handle, 1/2-in., 5/8-in.
3	6	9	Reamers, straight, 3/16-in.
3	6	9	Reamers, straight, 7/32-in.
6	12	16	Reamers, straight, 1/4-in.
3	6	9	Reamers, straight, 9/32-in.
6	12	16	Reamers, straight, 5/16-in.
3	6	9	Reamers, straight, 11/32-in.
6	12	16	Reamers, straight, 3/8-in.
3	6	9	Reamers, straight, 13/32-in.
6	9	16	Reamers, straight, 7/16-in.
3	6	9	Reamers, straight, 15/32-in.
6	12	16	Reamers, straight, 1/2-in.
3	6	9	Reamers, straight, 17/32-in.
4	8	12	Reamers, straight, 9/16-in.
3	6	9	Reamers, straight, 19/32-in.
3	6	9	Reamers, straight, 5/8-in.
2	4	6	Reamers, straight, 21/32-in.
3	6	9	Reamers, straight, 11/16-in.
2	4	6	Reamers, straight, 23/32-in.
3	6	9	Reamers, straight, 3/4-in.
2	4	6	Reamers, expansion, 1/2-in to 5/8-in.
2	4	6	Reamers, expansion, 5/8-in. to 3/4-in.
2	4	6	Reamers, expansion, 3/4-in. to 7/8-in.
2	4	6	Reamers, expansion, 7/8-in. to 1-in.
2	4	6	Reamers, expansion, 1-in. to 1 1/8-in.
2	4	6	Reamers, expansion, 1 1/8-in. to 1 1/4-in.
2	4	6	Reamers, Taper, Morse, No. 0.
2	4	6	Reamers, Taper, Morse, No. 1.
2	4	6	Reamers, Taper, Morse, No. 2.
2	4	6	Reamers, Taper, Morse, No. 3.
2	4	6	Reamers, Taper, Morse, No. 4.
2	4	6	Reamers, Taper, Morse, No. 5.
2	4	6	Reamers, Taper, Morse, No. 6.
2	4	6	Reamers, Taper, Morse, No. 7.
3	6	12	Rule, steel, metric, 15-cm.
8	16	24	Saw, back, 14-in.

Quantity			
1/4 Size	*1/2 Size*	*Full Size*	**Description**
2	4	6	Screw Plate, S. A. E. threads, 1/4-in. to 1-in. by 16ths, complete with stocks, dies, taps and tap wrenches.
4	8	12	Shave, spoke, No. 66, Stanley.
4	8	12	Square, bevel, 10-in., No. 18, Stanley.
4	6	12	Square, machinist's 12-in.
4	6	8	Square, machinist's, try, 6-in.
1	2	3	Stake, tinsmith's beak horn.
1	2	3	Stake, tinsmith's bottom.
1	2	3	Stake, tinsmith's bevel edge.
1	2	3	Stake, tinsmith's square.
1	2	3	Stake. tinsmith's round head.
1	2	3	Stake, tinsmith's seaming.
4	8	16	Shovel, forge.
2	3	6	Stencil, letter, 4-in. set.
2	4	6	Stencil, number, 4-in. set.
6	24	60	Stone, oil, double face, 2-in. by 6-in.
10	24	80	Scraper, carbon, set.
1	3	6	Straight edge, steel, 3-ft., in suitable case.
12	24	24	Taps, No. 8—32.
12	24	24	Taps, No. 10—32.
12	24	24	Taps, No. 10—24.
2	6	12	Taps, bottoming, set, 1/4-in. to 7/8-in. by 16ths, S. A. E. and U. S. Std.
10	12	16	Taps, pipe threads, 1/8-in.
10	12	16	Taps, pipe threads, 1/4-in.
2	6	12	Taps, hand, taper set, 1 1/8-in. and 1 1/4-in. S. A. E. and U. S. Std.
6	8	12	Taps, pipe threads, 3/8-in.
4	8	12	Taps, pipe threads, 1/2-in.
2	6	9	Taps, pipe threads, 3/4-in.
1	2	3	Taps, pipe threads, 1-in.
1	2	3	Taps, pipe threads, 1 1/4-in.
2	3	4	Taps, metric, set, 6 mm. to 12 mm.
3	4	6	Thermometers, dairy, Fahrenheit.
100	150	200	Test clips, battery charging, large, Mueller.
2	2	3	Torch, preheating, gasoline.
4	4	6	Wire wheel brushes, 8-in. diameter, medium bristles, for tire work.
4	6	12	Wrench, tap, «T» handle, for taps up to 1/4-in.
4	6	12	Wrench, for reamers, 1/8-in. to 1/4-in.
4	6	12	Wrench, for reamers, 1/4-in. to 5/8-in.
4	6	12	Wrench, for reamers, 5/8-in. to 1 1/4-in.
6	20	40	Wrenches, socket, Auto Cle, large set as follows: One take-down reversible ratchet handle, nickel-plated. One swivel or universal joint, which permits use of the wrench at any angle. One 9 1/2-in. extension bar. One 1 3/4-in. extension bar. Two sizes of screwdriver bits. Thirty-one sizes of mottled, case-hardened, pressed steel socket.

Quantity 1/4 Size	 1/2 Size	 Full Size	Description
			Sizes of sockets furnished: 5/16-in., 11/32-in., 3/8-in., 13/32-in., 7/16-in., 15/32-in., 1/2-in., 17/32-in., 9/16-in., 19/32-in., 5/8-in., 21/32-in., 11/16-in., 23/32-in., 3/4-in., 25/32-in., 13/16-in., 27/32-in., 7/8-in., 29/32-in., 15/16-in., 31/32-in., 1-in., 1 1/32-in., 1 3/32-in., 1 5/32-in., 1 9/32-in.
			Special spark plug socket, 29/32-in. by 4-in.
			Square sockets: 13/32-in., 17/32-in., 21/32-in.
			These sockets will fit all set screws, bolts and nuts in general use on automobiles of American or foreign make.
			The above parts and sockets are contained in a compact hardwood case fitted with pegs on which to place the sockets, thus making loss of parts unlikely and preventing rattle or noise.
4	6	9	Wrenches, monkey, 24-in., steel handle.
10	24	48	Wrenches, Stillson, 6-in., steel handle.
8	20	30	Wrenches, Stillson, 10-in., steel handle.
4	12	24	Wrenches, Stillson, 14-in., steel handle.
1	4	8	Wrenches, Stillson, 24-in., steel handle.

Equipment for Reception Park

456. The following Individual Tool Kits are issued to the personnel:

100	Chassis Repair Mechanic	Kit No. 1
3	Blacksmith	Kit No. 2
5	Motorcycle Mechanic	Kit No. 3
2	Carpenter and Wheelwright	Kit No. 4
2	Welder	Kit No. 5
10	Motor Mechanic	Kit No. 6
5	Machinist	Kit No. 7
3	Electrical and Carburetor Mechanic	Kit No. 8
3	Radiator and Sheet Metal Mechanic	Kit No. 9
2	Trimmer	Kit No. 10
1	Tire Press Mechanic	Kit No. 11
10	Painter	Kit No. 12
4	Vulcanizer	Kit No. 13
8	Battery Repair Mechanic	Kit No. 14

The increment of equipment added to the above listed Individual Tool Kits to form one (1) complete Equipment for Reception Park consists of twice the increment listed under Equipment for Immobile Service Park, with the following additions and exceptions:

Additions

Extra equipment to be furnished:

20	Jacks, lifting, 5-ton capacity.
100	Cleaning brushes, 1 1/2-in. round, for use with gasoline.
25	Gooseneck wrecking bars, 30-in. long x 7/8-in. or 3/4-in. in diameter.
10	Nail Pullers, Cyclops or equal.
20	Vises, 5-in. jaw, bench, machinist's.
15	Crowbars, 25-lb.
15	Crowbars, 12-lb.

2 Pneumatic riveting hammers, each hammer to be fitted with the following sizes of button or round head rivet sets: 1/4-in., 5/8-in., 3/8-in., 7/16-in., 1/2-in., 9/16-in., 5/8-in.
2 Air storage tanks, suitable size and strength for above compressor.
200 Ft. air hose, 3/8-in. diameter, best quality to stand 100 lbs. pressure.
6 Sets air hose, male and female couplings for 3/8-in. hose.

Exceptions

Whenever electric power from some outside source cannot be obtained, furnish 25-K. W. General Electric Gasoline Electric Set, with switchboard instead of 7 1/2-K. W. Gasoline Electric Set.
Supply same battery charging switchboard as furnished for Full Size Overhaul Park.
Only one tire press is to be furnished.

Reconstruction Park Equipment

457. Reconstruction park equipment consists of suitable multiples of the several equipments which go to make up that allowed a full sized overhaul park. To these multiples is added a quantity of specially authorized equipment in the way of labor saving machinery, oxygen and acetylene gas generating equipment and other special departments and facilities which make of the reconstruction park a place for the centralizing of ultra special equipment.

458. Decauville Track for Overhaul Parks

Full Size Overhaul Park:

3,000 Lineal feet of track, 40-cm. gauge.
25 Turntables, 40-cm. gauge.
25 Turnouts with points, frogs and hand lever switches, 40-cm. gauge.
40 Cars of the Lorry Type, 40-cm. gauge.

One-Half Size Overhaul Park:

3,000 Lineal feet of track, 40-cm. gauge.
15 Turntables, 40-cm. gauge.
15 Turnouts with points, frogs and hand lever switches, 40-cm. gauge.
20 Cars of the Lorry Type, 40-cm. gauge.

One-Quarter Size Overhaul Park:

2.000 Lineal feet of track, 40-cm. gauge.
10 Turntables, 40-cm. gauge.
10 Turnouts with points, frogs and hand lever switches, 40-cm. gauge.
10 Cars of the Lorry Type, 40-cm. gauge.
When 40-cm. gauge track cannot be furnished, substitute 60-cm. gauge.

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